London Platform Capabilities

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Contents

Now Platform Capabilities.................................................................9
  Agent Intelligence...........................................................................9
    Get started with Agent Intelligence............................................. 14
    Create and train a solution definition........................................ 18
    Review solution statistics......................................................... 24
    Review prediction results over time.......................................... 28
    Test a solution prediction......................................................... 28
  Preserve ML solutions during a system clone.............................. 31
  Domain separation and Agent Intelligence.................................... 32
    Configuration tips for Agent Intelligence................................. 32
Configuration Management Database (CMDB)........................................... 35
  Configuration Management and the CMDB................................. 37
  Domain separation in Configuration Management Database (CMDB)... 38
  ITIL Configuration Management integration.................................. 39
  ITIL............................................................................................... 40
  Populate the CMDB...................................................................... 42
  Baseline CMDB........................................................................... 46
  Managing proposed changes....................................................... 47
  CI relationships in the CMDB...................................................... 52
  CMDB classifications.................................................................. 70
  Querying the CMDB................................................................... 81
  CMDB CI Lifecycle Management.................................................. 94
  CMDB groups............................................................................. 103
  CMDB Identification and Reconciliation...................................... 105
  CMDB Health............................................................................. 148
  Duplicate CIs............................................................................. 177
  CI Class Manager........................................................................ 185
  Application services.................................................................... 186
  View CMDB benchmarks............................................................ 219
  CMDB APIs (CMDB SDK)........................................................... 220
  Useful related lists in CI forms.................................................... 221
  Activate the Extended CMDB plugins........................................ 222
  Help the Help Desk..................................................................... 223
  Table form views......................................................................... 234
  Out-of-the-box Configuration Management (CMDB) Performance Analytics Solutions.................................................................................................................................................. 234
Dependency Views........................................................................ 235
  Components installed with Dependency Views............................ 235
  Supported browsers for Dependency Views............................... 239
  Domain separation and Dependency Views................................. 240
  Dependency Views map............................................................... 240
  Dependency Views map menus and controls............................... 241
  Cluster nodes in a Dependency Views map................................... 246
  Virtual grouping of nodes in a Dependency Views map................ 248
  Use Dependency Views............................................................... 250
  Administer Dependency Views.................................................... 255
Compliance..................................................................................... 266
  Compliance Activation................................................................. 266
  Installed with Compliance........................................................ 266
  Compliance Templates and Audits............................................... 272
  Compliance Overview module................................................... 272
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture Compliance</td>
<td>274</td>
</tr>
<tr>
<td>Desired State</td>
<td>278</td>
</tr>
<tr>
<td>Certification audits</td>
<td>284</td>
</tr>
<tr>
<td>Certification filters</td>
<td>301</td>
</tr>
<tr>
<td>Certification follow-on tasks</td>
<td>309</td>
</tr>
<tr>
<td>Certification templates</td>
<td>314</td>
</tr>
<tr>
<td>Controls and tests management</td>
<td>328</td>
</tr>
<tr>
<td>Scripted audits</td>
<td>338</td>
</tr>
<tr>
<td>Data Certification</td>
<td>347</td>
</tr>
<tr>
<td>Activate Data Certification</td>
<td>348</td>
</tr>
<tr>
<td>Certification schedules</td>
<td>355</td>
</tr>
<tr>
<td>Certification tasks</td>
<td>357</td>
</tr>
<tr>
<td>Certification elements</td>
<td>359</td>
</tr>
<tr>
<td>Certification instances</td>
<td>360</td>
</tr>
<tr>
<td>Certification audit instances</td>
<td>360</td>
</tr>
<tr>
<td>Certification audit definition</td>
<td>361</td>
</tr>
<tr>
<td>Data Certification Overview module</td>
<td>363</td>
</tr>
<tr>
<td>Data Certification planning</td>
<td>366</td>
</tr>
<tr>
<td>Data certification performance</td>
<td>378</td>
</tr>
<tr>
<td>Reassign a certification task</td>
<td>385</td>
</tr>
<tr>
<td>Send certification task reminders</td>
<td>385</td>
</tr>
<tr>
<td>Mark a certification task as closed incomplete</td>
<td>386</td>
</tr>
<tr>
<td>Certification tasks cancellation</td>
<td>387</td>
</tr>
<tr>
<td>Domain separation and Data Certification</td>
<td>387</td>
</tr>
<tr>
<td>Content Management System</td>
<td>388</td>
</tr>
<tr>
<td>Content Management design</td>
<td>388</td>
</tr>
<tr>
<td>Domain separation in the Content Management System</td>
<td>396</td>
</tr>
<tr>
<td>Activate the Content Management System</td>
<td>396</td>
</tr>
<tr>
<td>Configure Content Management sites</td>
<td>399</td>
</tr>
<tr>
<td>Content Management integration points</td>
<td>450</td>
</tr>
<tr>
<td>Content Management testing</td>
<td>458</td>
</tr>
<tr>
<td>Global search in Content Management</td>
<td>459</td>
</tr>
<tr>
<td>CMS translation</td>
<td>459</td>
</tr>
<tr>
<td>Connect</td>
<td>460</td>
</tr>
<tr>
<td>Supported browsers for Connect</td>
<td>460</td>
</tr>
<tr>
<td>Activate Connect</td>
<td>461</td>
</tr>
<tr>
<td>Activate Connect Support</td>
<td>464</td>
</tr>
<tr>
<td>Connect interface</td>
<td>468</td>
</tr>
<tr>
<td>Enable or disable Connect notifications globally</td>
<td>478</td>
</tr>
<tr>
<td>Edit which notifications you receive for a conversation</td>
<td>480</td>
</tr>
<tr>
<td>Upload a profile picture</td>
<td>481</td>
</tr>
<tr>
<td>Drag a file into a Connect conversation</td>
<td>482</td>
</tr>
<tr>
<td>Share a Visual Task Board in a Connect conversation</td>
<td>483</td>
</tr>
<tr>
<td>Mention a user in a Connect conversation</td>
<td>483</td>
</tr>
<tr>
<td>Connect administration</td>
<td>484</td>
</tr>
<tr>
<td>Connect Chat</td>
<td>493</td>
</tr>
<tr>
<td>Connect Support</td>
<td>499</td>
</tr>
<tr>
<td>Live Feed</td>
<td>516</td>
</tr>
<tr>
<td>Live Feed browser support</td>
<td>518</td>
</tr>
<tr>
<td>Activate Live Feed</td>
<td>518</td>
</tr>
<tr>
<td>Administer live feed</td>
<td>518</td>
</tr>
<tr>
<td>Use Live Feed</td>
<td>538</td>
</tr>
<tr>
<td>Notifications</td>
<td>596</td>
</tr>
<tr>
<td>Email and SMS notifications</td>
<td>596</td>
</tr>
<tr>
<td>Push notifications</td>
<td>596</td>
</tr>
<tr>
<td>Subscription-based notifications</td>
<td>789</td>
</tr>
<tr>
<td>Data Certification</td>
<td>347</td>
</tr>
<tr>
<td>Connect</td>
<td>460</td>
</tr>
<tr>
<td>Supported browsers for Connect</td>
<td>460</td>
</tr>
<tr>
<td>Activate Connect</td>
<td>461</td>
</tr>
<tr>
<td>Activate Connect Support</td>
<td>464</td>
</tr>
<tr>
<td>Connect interface</td>
<td>468</td>
</tr>
<tr>
<td>Enable or disable Connect notifications globally</td>
<td>478</td>
</tr>
<tr>
<td>Edit which notifications you receive for a conversation</td>
<td>480</td>
</tr>
<tr>
<td>Upload a profile picture</td>
<td>481</td>
</tr>
<tr>
<td>Drag a file into a Connect conversation</td>
<td>482</td>
</tr>
<tr>
<td>Share a Visual Task Board in a Connect conversation</td>
<td>483</td>
</tr>
<tr>
<td>Mention a user in a Connect conversation</td>
<td>483</td>
</tr>
<tr>
<td>Connect administration</td>
<td>484</td>
</tr>
<tr>
<td>Connect Chat</td>
<td>493</td>
</tr>
<tr>
<td>Connect Support</td>
<td>499</td>
</tr>
<tr>
<td>Live Feed</td>
<td>516</td>
</tr>
<tr>
<td>Live Feed browser support</td>
<td>518</td>
</tr>
<tr>
<td>Activate Live Feed</td>
<td>518</td>
</tr>
<tr>
<td>Administer live feed</td>
<td>518</td>
</tr>
<tr>
<td>Use Live Feed</td>
<td>538</td>
</tr>
<tr>
<td>Notifications</td>
<td>596</td>
</tr>
<tr>
<td>Email and SMS notifications</td>
<td>596</td>
</tr>
<tr>
<td>Push notifications</td>
<td>596</td>
</tr>
<tr>
<td>Subscription-based notifications</td>
<td>789</td>
</tr>
<tr>
<td>Data Certification</td>
<td>347</td>
</tr>
<tr>
<td>Section</td>
<td>Page</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Understanding Service Portal</td>
<td>2610</td>
</tr>
<tr>
<td>Content Management and Service Portal</td>
<td>2614</td>
</tr>
<tr>
<td>Supported features in Service Portal</td>
<td>2634</td>
</tr>
<tr>
<td>Domain separation in Service Portal</td>
<td>2642</td>
</tr>
<tr>
<td>Orchestration</td>
<td>1741</td>
</tr>
<tr>
<td>Introduction to Orchestration</td>
<td>1741</td>
</tr>
<tr>
<td>Domain separation in Orchestration</td>
<td>1744</td>
</tr>
<tr>
<td>Activate Orchestration</td>
<td>1744</td>
</tr>
<tr>
<td>Orchestration applications</td>
<td>1766</td>
</tr>
<tr>
<td>Orchestration examples</td>
<td>1819</td>
</tr>
<tr>
<td>Orchestration activity packs</td>
<td>1839</td>
</tr>
<tr>
<td>Orchestration activity designer</td>
<td>1990</td>
</tr>
<tr>
<td>Orchestration databus</td>
<td>2101</td>
</tr>
<tr>
<td>MID Servers for Orchestration</td>
<td>2103</td>
</tr>
<tr>
<td>Use the Orchestration Usage dashboard</td>
<td>2109</td>
</tr>
<tr>
<td>Password Reset application</td>
<td>2110</td>
</tr>
<tr>
<td>Password Reset setup guide</td>
<td>2111</td>
</tr>
<tr>
<td>Password Reset admin guide</td>
<td>2129</td>
</tr>
<tr>
<td>User guide: Resetting your password</td>
<td>2215</td>
</tr>
<tr>
<td>Response templates</td>
<td>2223</td>
</tr>
<tr>
<td>Activate response templates</td>
<td>2224</td>
</tr>
<tr>
<td>Assign response template roles</td>
<td>2226</td>
</tr>
<tr>
<td>Create or modify a response template</td>
<td>2226</td>
</tr>
<tr>
<td>Self-service</td>
<td>2231</td>
</tr>
<tr>
<td>Service catalog requests</td>
<td>2231</td>
</tr>
<tr>
<td>Service Delegation</td>
<td>2240</td>
</tr>
<tr>
<td>Service administration</td>
<td>2242</td>
</tr>
<tr>
<td>Assessments</td>
<td>2242</td>
</tr>
<tr>
<td>Approvals</td>
<td>2404</td>
</tr>
<tr>
<td>Geolocation</td>
<td>2425</td>
</tr>
<tr>
<td>State flows</td>
<td>2430</td>
</tr>
<tr>
<td>Survey Management</td>
<td>2438</td>
</tr>
<tr>
<td>Quizzes</td>
<td>2536</td>
</tr>
<tr>
<td>Wizards</td>
<td>2570</td>
</tr>
<tr>
<td>Service Portal</td>
<td>2610</td>
</tr>
<tr>
<td>Understanding Service Portal</td>
<td>2611</td>
</tr>
<tr>
<td>Content Management and Service Portal</td>
<td>2614</td>
</tr>
<tr>
<td>Supported features in Service Portal</td>
<td>2634</td>
</tr>
<tr>
<td>Domain separation in Service Portal</td>
<td>2642</td>
</tr>
<tr>
<td>Set up Service Portal</td>
<td>2642</td>
</tr>
<tr>
<td>Section</td>
<td>Page</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Create a portal</td>
<td>2647</td>
</tr>
<tr>
<td>Service Portal pages</td>
<td>2665</td>
</tr>
<tr>
<td>Service Portal widgets</td>
<td>2688</td>
</tr>
<tr>
<td>Service Portal search</td>
<td>2856</td>
</tr>
<tr>
<td>Service Portal announcements</td>
<td>2874</td>
</tr>
<tr>
<td>Service Portal security</td>
<td>2879</td>
</tr>
<tr>
<td>Service Portal SCSS Primer</td>
<td>2893</td>
</tr>
<tr>
<td>Subscription Management</td>
<td>2898</td>
</tr>
<tr>
<td>Subscription Management setup guide</td>
<td>2899</td>
</tr>
<tr>
<td>Subscription Management admin guide</td>
<td>2900</td>
</tr>
<tr>
<td>Survey Management</td>
<td>2923</td>
</tr>
<tr>
<td>Get started with Survey Management</td>
<td>2923</td>
</tr>
<tr>
<td>Survey responses and results</td>
<td>2929</td>
</tr>
<tr>
<td>Survey administration</td>
<td>2947</td>
</tr>
<tr>
<td>Task Communications Management</td>
<td>3021</td>
</tr>
<tr>
<td>Activate Task Communication Management</td>
<td>3023</td>
</tr>
<tr>
<td>Working with Task Communications Management</td>
<td>3029</td>
</tr>
<tr>
<td>Timeline Visualizations</td>
<td>3035</td>
</tr>
<tr>
<td>Activate Timeline Visualization</td>
<td>3037</td>
</tr>
<tr>
<td>Create a Timeline Visualization</td>
<td>3039</td>
</tr>
<tr>
<td>Create a Timeline Visualization view</td>
<td>3045</td>
</tr>
<tr>
<td>Planning Your Timeline Visualization</td>
<td>3045</td>
</tr>
<tr>
<td>Use Timeline Visualization</td>
<td>3045</td>
</tr>
<tr>
<td>Virtual Agent</td>
<td>3053</td>
</tr>
<tr>
<td>Implementing Virtual Agent</td>
<td>3057</td>
</tr>
<tr>
<td>Transferring Virtual Agent conversations to a live agent</td>
<td>3088</td>
</tr>
<tr>
<td>Virtual Agent Designer</td>
<td>3093</td>
</tr>
<tr>
<td>Virtual Agent scripts</td>
<td>3154</td>
</tr>
<tr>
<td>Virtual Agent localization</td>
<td>3158</td>
</tr>
<tr>
<td>Visual Task Boards</td>
<td>3159</td>
</tr>
<tr>
<td>Activate Visual Task Boards</td>
<td>3159</td>
</tr>
<tr>
<td>Domain separation in Visual Task Boards</td>
<td>3160</td>
</tr>
<tr>
<td>Installed with Visual Task Boards</td>
<td>3160</td>
</tr>
<tr>
<td>Supported browsers for Visual Task Boards</td>
<td>3160</td>
</tr>
<tr>
<td>Visual task board structure</td>
<td>3163</td>
</tr>
<tr>
<td>Visual task board use</td>
<td>3164</td>
</tr>
<tr>
<td>Configure a task board</td>
<td>3168</td>
</tr>
<tr>
<td>Configure Visual Task Board labels</td>
<td>3194</td>
</tr>
<tr>
<td>Modify the query or lane field for an existing board</td>
<td>3196</td>
</tr>
<tr>
<td>Configure the card limit for freeform boards</td>
<td>3197</td>
</tr>
<tr>
<td>Configure the card limit for flexible and guided boards</td>
<td>3198</td>
</tr>
<tr>
<td>Configure the task board card view</td>
<td>3198</td>
</tr>
<tr>
<td>Workflow</td>
<td>3198</td>
</tr>
<tr>
<td>Getting started with workflows</td>
<td>3199</td>
</tr>
<tr>
<td>Workflow editor</td>
<td>3202</td>
</tr>
<tr>
<td>Workflow management</td>
<td>3222</td>
</tr>
<tr>
<td>Workflow concepts</td>
<td>3318</td>
</tr>
<tr>
<td>Workflow administration</td>
<td>3328</td>
</tr>
<tr>
<td>Troubleshoot workflows</td>
<td>3362</td>
</tr>
<tr>
<td>Use the Workflow Operations Dashboard</td>
<td>3365</td>
</tr>
<tr>
<td>Workflow performance timing</td>
<td>3367</td>
</tr>
<tr>
<td>Workflow activities</td>
<td>3367</td>
</tr>
</tbody>
</table>

Index........................................................................................................................................... 3472
Now Platform Capabilities

The Now Platform® delivers a system of action for the enterprise. Using a single data model, it makes it easy to create contextual workflows and automate business processes.

Watch this six-minute video for a technical overview of the Now Platform architecture.

Agent Intelligence

The ServiceNow® Agent Intelligence product enables you to use machine-learning algorithms to set field values during record creation, such as setting the incident category based on the short description. You can train predictive models so they act as an agent to automatically categorize and route work based on your past record-handling experience.

Note: Agent Intelligence is not supported on on-premise instances, as its solution training functionality requires processing in ServiceNow datacenters.

Note: In artificial intelligence communities, the term "train" is used for machine-learning discourse in the same way we use it for humans and animals. For example, you can train horses, and you can train data sets.
Enable Agent Intelligence to handle higher volumes of incoming requests at lower costs. Automate the categorization and assignment of requests to gain these benefits.

- Reduce task resolution times.
- Reduce the number of interactions required to resolve tasks.
- Reduce the error rates of categorizing and assigning work.

Training your machine-learning solutions

Agent intelligence enables you to train predictive models and machine-learning solutions that you can apply to your business processes, such as:

- Incident categorization: Predicts the incident category based on the short description. See Agent Intelligence for Incident Management.
- CSM case assignment: Predicts the case record assignment group based on the short description. See Agent Intelligence for Customer Service Management.

You can also extend Agent Intelligence to other processes by creating your own predictive models and training them on your past record data.
A predictive model consists of these components, some of which you must provide.

**Solution definition**

A data record you create and configure that specifies these values for training a predictive model.

- The records used to train the model. For example, only train on incidents that have been resolved or closed within the last 6 months.
- The input fields the model uses to make predictions. For example, use the incident short description to make a prediction.
- The output field whose value the model predicts. For example, set the incident category based on the short description.
- The frequency to retrain the model. For example, retrain the model every 30 days.

**Solution**

A Java object produced when you train a solution definition at a ServiceNow datacenter. Agent Intelligence uses this object to predict a target field value given one or more input field values. All solutions specify these values.

- The solution *precision* is the aggregate percentage of correct predictions. For example, a precision of 50 means that out of 100 predictions, half of them should have the correct value.
- The solution *coverage* is the aggregate percentage of records that receive a prediction. For example, a coverage of 50 means half of all eligible records actually receive a prediction.
- The solution *classes* are the output field values for which the model can make predictions. Each class is an output field value with a list of possible precision, coverage, and distribution metrics to choose from. For example, the Incident Categorization solution has a class for each category such as software, inquiry, and database.
- The class *distribution* is the percentage of records from the entire table that have this particular output field value. For example, a distribution of 50 for the inquiry class means that half of incidents have the inquiry category.

**Business rule**

A rule that calls the solution data set to generate a prediction when a new record is created.

**Selecting data records for training your solution**

A solution is only as good as the record data you use to train it. In general, a good training dataset has these characteristics.
• The solution definition input fields are available to users when creating records. To make predictions at record creation, the solution must have the input field values at record creation.
• The solution definition output field is a choice field. To make more accurate predictions, limit the output field to a finite set of possible values.
• The training records only contain correct values for the output field. To make more accurate predictions, filter out any records that have unreliable output field values. For example, if recently closed incidents are subject to review and change for a month, filter out any recently-closed incidents.
• The training records contain multiple examples of each output field value you want the solution to predict. To provide more record coverage, include multiple examples of each output field value.
• The training records include common variations of the input fields. To provide more record coverage, include multiple examples of input field values.

Exporting your solution for training

![Figure 1: Training flow](image)

To train a solution, you export its solution definition and associated records to the nearest training service at a ServiceNow datacenter. If you have data sovereignty requirements, training is not available. When
training is complete, the training service exports the solution back to the instance and deletes all customer
training data from the training service servers.

Note: All communications between the instance and the training service are over HTTPS.

Prediction business rules

By default, the system uses these business rules for Agent Intelligence.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default Task Based Prediction</td>
<td>A business rule that runs before inserting new task records to make a field value prediction based on the solution definition output field and the solution dataset. Use this business rule as a template to create your own prediction logic. This business rule calls the Agent Intelligence API.</td>
</tr>
<tr>
<td>Update Prediction Results</td>
<td>A business rule that runs before closing task records to update the solution statistics with the actual precision and coverage results.</td>
</tr>
</tbody>
</table>

Monitoring your predictive model coverage and precision

You can track the coverage and precision of each predictive model using the Solution Statistics dashboard, which provides reporting on these prediction areas by default.

<table>
<thead>
<tr>
<th>Report</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Prediction Coverage (last 30 days)</td>
<td>Shows the average prediction coverage of a solution for the last 30 days. The value represents the percentage of predictions that yielded an outcome out of the total number of predictions attempted. Click the coverage score to see a breakdown by class.</td>
</tr>
<tr>
<td>Daily Prediction Coverage</td>
<td>Shows the daily prediction coverage of a solution. The value represents the percentage of records created on a given day where the solution was able to predict an outcome.</td>
</tr>
<tr>
<td>Average Prediction Precision (last 30 days)</td>
<td>Shows the average prediction precision of a solution for the last 30 days. The value represents the percentage of predictions where the predicted value was the same as the final value of the field when the record closed. Click the precision score to see a breakdown by class.</td>
</tr>
<tr>
<td>Daily Prediction Precision</td>
<td>Shows the daily prediction precision of a solution. The value represents the percentage of records closed on a given day where the predicted field value was the same as the final value.</td>
</tr>
</tbody>
</table>
Get started with Agent Intelligence

Implement initial setup and configuration steps for Agent Intelligence to train a machine-learning (ML) algorithm to make predictions based on your past record data.

Role required: admin or ml_admin

The training process requires sending record data to a training service in the nearest data center and is therefore unavailable to customers who have data sovereignty requirements.

1. Activate Agent Intelligence on a non-production instance.
2. From your production instance, export the records that you want your Agent Intelligence solutions to process.
   For example, export 12 months of incident records to a non-production instance.
3. On a non-production instance, import the records you exported.
4. On the non-production instance, review the default solution definition records to determine if the filter, input fields, and output field are sufficient to predict your incident or task records. If necessary, create a solution definition for each record set you want to predict.
5. On the non-production instance, train the solution definition records you want to test.
6. On the non-production instance, enable the Default Task Based Prediction business rule. If you have created custom solution definition records, update the business rule with the solution definitions you want to enable.
7. Test the solution predictions by either creating test records or importing more records from production.
8. Review the prediction reports to determine the accuracy and coverage of your solution and individual classes.
9. If necessary, update the solution definition filter to include more or different training records.
10. Retrain and retest any updated solution definition records.
11. When you are satisfied with the accuracy and coverage of your solutions, activate Agent Intelligence on your production instance.
12. Recreate any custom solution definition records and business rules to your production instance, and retrain the solutions.

Activate Agent Intelligence

Agent Intelligence is included in the following packages: ITSM Professional, CSM Professional, HR Professional, and HR Enterprise. When you subscribe to any of these packages, you can activate Agent Intelligence on your production instance.

Role required: admin

If your current subscription does not include Agent Intelligence as provided in the ITSM Professional, CSM Professional, HR Professional, or HR Enterprise packages, contact your ServiceNow account manager.

If you want to use Agent Intelligence outside of these applications, contact your account manager for licensing options.

1. Activate the Agent Intelligence plugin (com.glide.platform_ml) and the Agent Intelligence Reports plugin (com.glide.platform_ml_pa) on your production instance.
2. Confirm that the activation has successfully created a sharedservice.worker user.
   These plugins utilize this user for training your ML solutions.
If your instance is on an earlier release version than Kingston Patch 2, such as Kingston Patch 0 or Kingston Patch 1, update the scheduler URL property before you create and train a solution definition.

1. In the application navigator, enter: sys_properties.list.
2. Search for and click the glide.shared_service_scheduler.url property.
3. Update the value of the glide.shared_service_scheduler.url system property to https://sncmscheduler.service-now.com/.

Agent Intelligence for Incident Management

Use the default Agent Intelligence records as templates to create Incident Management-specific solutions.

Solution definitions

These solution definitions are available as templates on instances where both Agent Intelligence and Incident Management are active. Create your own solution definition records to customize the behavior.

<table>
<thead>
<tr>
<th>Solution Definition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incident Assignment</td>
<td>Predicts the Assignment group field from the Short description.</td>
</tr>
<tr>
<td>Incident Categorization</td>
<td>Predicts the Category field from the Short description.</td>
</tr>
</tbody>
</table>

Business rules

These business rules are available on instances where both Agent Intelligence and Incident Management are active. Create your own business rules on the Incident table to customize prediction and reporting behaviors.

<table>
<thead>
<tr>
<th>Business rule</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default Incident Based Prediction</td>
<td>Incident</td>
<td>Generates prediction results for active Incident Management solutions. Shows prediction results in an information message to users with the itil role. Runs when an incident record is inserted. Only updates the output field with a predicted value if it has not been previously set to a value different from the default value.</td>
</tr>
</tbody>
</table>

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If your instance is running on Kingston and you are upgrading to the London release:

- The Default Incident Based Prediction business rule is replaced with the read-only Incident Based Prediction (Template). Make a copy of this business rule and customize it to reflect the specifics of your implementation and activate it.
- In a global domain environment, use the new solutionNames array variable which requires that you explicitly provide the solutions that are called by the business rule.
- In a domain-separated environment, such as an MSP environment, refer to the commented code in the business rule template for easy customization.
- The business rule template now calls the applyPredictionForSolution() method to predict regardless of any changes to the default value.

You can manage prediction drift by retraining, modifying, or creating new solutions to reflect changes in your business conditions. Test and modify your business rule over time to ensure it works as desired across multiple consumption points and user Personas.

Agent Intelligence for Customer Service Management

Use the default Agent Intelligence records as templates to create Customer Service Management-specific solutions.

Solution definitions

These solution definitions are available as templates on instances where both Agent Intelligence and Customer Service Management are active. Create your own solution definition records to customize the behavior.

<table>
<thead>
<tr>
<th>Solution Definition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSM Case Assignment</td>
<td>Predicts the Assignment group field from the Short description.</td>
</tr>
<tr>
<td>CSM Case Categorization</td>
<td>Predicts the Category field from the Short description.</td>
</tr>
<tr>
<td>CSM Case Prioritization</td>
<td>Predicts the Priority field from the Short description.</td>
</tr>
</tbody>
</table>

Business rules

These business rules are available on instances where both Agent Intelligence and Customer Service Management are active. Create your own business rules on the Case [sn_customerservice_case] table to customize prediction and reporting behaviors.
Table 4: Business rules for Customer Service Management

<table>
<thead>
<tr>
<th>Business rule</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default Case Based Prediction</td>
<td>Case [sn_customerservice_case]</td>
<td>Generates prediction results from the active Customer Service Management solutions. Shows prediction results when a Case record is inserted. Only updates the output field with a predicted value if it has not been previously set to a value that is different from the default value.</td>
</tr>
<tr>
<td>Update Prediction Results</td>
<td>Case [sn_customerservice_case]</td>
<td>Updates the solution precision and coverage statistics. Runs when a Case record is closed.</td>
</tr>
</tbody>
</table>

If your instance is running on Kingston and you are upgrading to the London release:

- Use the Default Case Based Prediction business rule template to create a new business rule. This rule includes a Solution variable that gets all active solutions retrieved by the findActiveSolution(solutionName) method.
- In a global domain environment, use the new solutionNames array variable which requires that you explicitly provide the solutions that are called by the business rule.
- In a domain-separated environment, such as an MSP environment, refer to the commented code in the business rule template for easy customization.
- The business rule template now calls the applyPredictionForSolution() method to predict regardless of any changes to the default value.

You can manage prediction drift by retraining, modifying, or creating new solutions to reflect changes in your business conditions. Test and modify your business rule over time to ensure it works as desired across multiple consumption points and user Personas.

Agent Intelligence for HR Service Delivery

Use the default Agent Intelligence records as templates to create HR Service Delivery-specific solutions.

Solution definitions

These solution definitions are available as templates on instances where both Agent Intelligence and HR Service Delivery are active. Create your own solution definition records to customize the behavior.

Table 5: Solution Definitions for HR Service Delivery

<table>
<thead>
<tr>
<th>Solution Definition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR Case Categorization</td>
<td>Predicts the HR service from the Short description and Description.</td>
</tr>
</tbody>
</table>
### Business rules

These business rules are available on instances where both Agent Intelligence and HR Service Delivery are active. Create your own business rules on the HR Case [sn_hr_core_case] table to customize prediction and reporting behaviors.

**Table 6: Business rules for HR Service Delivery**

<table>
<thead>
<tr>
<th>Business rule</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predict COE, Service after insert</td>
<td>HR Case [sn_hr_core_case]</td>
<td>Generates prediction results for active HR Service Delivery solutions. Runs before a new HR case record that is submitted by email is inserted.</td>
</tr>
</tbody>
</table>

### Create and train a solution definition

Specify the records used to train a predictive model, what fields trigger a prediction, and how often to retrain a solution.

**Role required:** admin or ml_admin

A predictive model is only as good as the data you use to train it. To select appropriate training records, familiarize yourself with the table database dictionary as well as the current quality of the record values to be used.

You must create a separate solution definition record for each predictive model you want to support. To expedite this process, you can copy a solution definition record and its configuration into a new form by clicking Copy Solution Definition from the context menu of the original record. You can use the new record to make further solution updates without reconfiguring the entire solution definition to change something minor.

**Note:**

- If your data is encrypted by FDE (Full Disc Encryption), you can train solutions.
- If the field you are using for training is encrypted using Platform Encryption, ensure that the sharedservice.worker user has the correct encryption context role that has been used for encryption.
- Agent Intelligence does not support training if you are using Edge Encryption.

1. Navigate to Agent Intelligence Solution Definitions.
   The system shows the current list of solution definitions.
2. Click New.
   The system shows a blank solution definition form.
3. Configure these field values per the guidance below.
<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
</table>
| Solution template   | Select a template to fill in the form with preset values. For example, the Incident Assignment Template selects the Incident table and creates a filter that selects resolved or closed incidents within the last 12 months.  
  
  **Note:** This field cannot have a value of None.  
  
  By default, Agent Intelligence offers these solution templates.  
  • Assignment Template  
  • Category Template  
  • Incident Assignment Template  
  • Incident Category Template  
  • Incident Priority Template  
  • Priority Template  

<table>
<thead>
<tr>
<th>Table</th>
<th>Select the table containing the target records to be predicted.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain</td>
<td>On instances where domain separation is active, select the domain whose target records you want to predict. Create a separate solution definition record for each domain whose field values you want to predict.</td>
</tr>
<tr>
<td>Label</td>
<td>Enter a name for the solution record.</td>
</tr>
<tr>
<td>Name</td>
<td>The system generates the value of this read-only field based on the Label.</td>
</tr>
<tr>
<td>Active</td>
<td>Select whether the system uses the solution definition record to train solutions. You can only train active solution definition records.</td>
</tr>
<tr>
<td>Field</td>
<td>Value</td>
</tr>
<tr>
<td>--------</td>
<td>-------</td>
</tr>
</tbody>
</table>
| Filter | Select the conditions you want to apply to the training records. To train a solution, the filter must return at least one record. If your filter returns no records, update it until it returns records for training.  

**Note:** The recommended number of records for training a good solution is from 30,000 through 300,000. If you submit more than 300,000 records, the most recent 300,000 records are used to train the solution. Use only authentic records from the database.  
The system provides a default filter when you select a Solution Template.  
A solution is only as good as the data you use to train it. In general, a good filter has these characteristics.  
- The training records are inactive and have task states that represent completing work within your standard process such as resolved or closed.  
- The training records only contain correct values for the target field. Filter out records with unreliable target field values. For example, if you are predicting the assignment group/category and you have assignment groups/categories in your historic incident data that are no longer used, add a filter to remove such incident records from the training.  
- The training records contain multiple examples of each target field value you want the solution to predict.  
- The training records include common variations of the input fields.  

For example, the Incident Category Template creates a filter with these conditions.  

```
[Created][on][Last 12 months] AND [Active][is][false] AND [State][is one of][Resolved | Closed]
```

Do not use hard-coded dates as filters, as these filters are not updated when the solutions are retrained unless you update them manually before every retraining. Instead, use relative date filters, such as last 3 months, last 6 months, and last 12 months.  

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<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processing Language</td>
<td>Select the dominant language of the dataset you are training on the solution definition. If the dataset language is English only, you can choose None, as English processing is applied to all datasets by default. For example, if you select Dutch, data is processed in both English and Dutch. Note: The term “processing” indicates some of the language-specific steps used as part of training a solution. For example, tokenizing words, removing stop words, and stemming.</td>
</tr>
<tr>
<td>Input fields</td>
<td>Select the input fields you want the solution to use to generate a prediction. The system provides default input fields when you select a Solution Template. In general, good input fields have these characteristics. • The fields are available to users when creating records. Configure the form to show all input fields. • The field data type is string. The more information a field provides, the more often a solution can make a prediction, and the more often predictions are accurate. • The field has a default value. The field should not have a blank value. For example, all default solution definitions use the Short description field as the input field.</td>
</tr>
<tr>
<td>Output field</td>
<td>Select the field whose value you want the predictive model to set. The system provides a default output field when you select a Solution Template. In general, a good output field has these characteristics. • The field is a choice field or a string field with a finite set of possible values. • The field has some casual connection to the input fields. For example, the Incident Category Template selects the Category field.</td>
</tr>
<tr>
<td>Field</td>
<td>Value</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Training frequency</td>
<td>Select how often the system regenerates the solution based on records matching the Filter. Options include:</td>
</tr>
</tbody>
</table>
|                     | • Run Once  
|                     | • Every 30 days  
|                     | • Every 60 days  
|                     | • Every 90 days  
|                     | • Every 120 days  
|                     | • Every 180 days  |
|                     | By default, the system runs training once. This practice provides you time to review and update the solution definition as needed until it provides acceptable coverage and precision values.  
|                     | When your solution definition is fairly stable, consider scheduled trainings, as data can age over time, thus degrading the accuracy of your prediction model.  |

4. Click the appropriate button for the solution definition.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activate &amp; Train</td>
<td>Activate and train a default solution definition.</td>
</tr>
<tr>
<td>Submit &amp; Train</td>
<td>Create a solution definition record and train it.</td>
</tr>
</tbody>
</table>

The Training Activation confirmation window appears.

5. Click OK to confirm.

The system schedules the solution for training with the nearest training service. When training is complete, the system uploads the solution as an Attachment record.

Review the trained solution precision and coverage statistics.

**Exclude a class from solution training**

Exclude a class from solution training to prevent the model from ever making predictions for a particular output field class. For example, you can exclude a particular incident category from training if you plan to retire or change the category.

Role required: admin or ml_admin

Excluding a class from training does not prevent the solution from making predictions for records that use the excluded class. Solution training still uses the input and output field values as data and attempts to match input field values to a new output field class. This attempt may cause undesirable prediction results unless you have another suitable class to replace the excluded class value.

Typically, you only exclude a class from training if you change the list of valid output field values. For example, if you replaced one Incident category with another Incident category, you may exclude the old category from training so that the solution only uses the new category for predictions.

1. Navigate to Agent Intelligence Solution Definitions.

The system shows the current list of solution definitions.
2. Select the solution definition you want to edit. For example, select Incident Categorization to exclude an incident category from training.

3. Edit the filter to exclude the class. You can use the [is one of] or [is not one of] operators to exclude a particular class.

4. Click Update & Train. The system schedules the solution for training with the nearest training service. When training is complete, the system uploads the solution as an Attachment record.

The solution excludes the class from all predictions.

Review the trained solution precision and coverage statistics.

**View solution training progress**

You can view solution training progress or statistics to determine if a solution is available or how long the next training cycle might take to complete.

Role required: admin or ml_admin

Solution training involves these steps.

1. Fetching files for training. The system downloads the training records and sends them to the nearest training service.

2. Preparing the data. The system removes duplicate records from the training set.

3. Training the solution. The training service trains the solution.

4. Uploading the trained solution. The training service uploads the solution as attachment records.

1. Navigate to Agent Intelligence Solutions. The system shows the current list of solutions.

2. Select the solution whose progress or statistics you want to view. For example, select Incident Categorization to see the training history.

3. From Related Links, click Show training progress. Training times vary based on the number of records and classes within the training set. The more records and classes you use, the longer the training can take. For example, a data set containing 100,000 records and several hundred classes can take around five hours to complete.

The system shows a Training Progress pop-up window.
Review the trained solution precision and coverage statistics.

**Review solution statistics**

Use the Solution Statistics dashboard to determine if a solution has sufficient precision and coverage for each class. Identify classes that require configuration or retraining with a new solution definition filter.

- Role required: admin, ml_admin, or ml_report_user
- To ensure optimal dashboard display, *enable responsive dashboards* or change the default dashboard layout.

The Solution Statistics dashboard lists the precision, coverage, and distribution for each class of active solutions. The maximum number of classes you can predict is 50. The system uses the top 50 classes with the highest number of records when it builds a solution. Note that the number of classes predicted may be less than 50, and can skip a class if there is not enough historical data to build a solution that can predict the class confidently.

1. Navigate to Agent Intelligence Reports Solution Statistics.
   The system displays the Solution Statistics dashboard.
2. From Filter by solution, select the solution whose statistics you want to review.
3. From Filter by version, select the solution version whose statistics you want to review.
4. Click Apply.
The system updates the dashboard based on the filters selected.

5. Identify classes with unwanted combinations of precision, coverage, and distribution values. For example, identify classes that have low precision or coverage but a high distribution.

6. Identify any missing classes you want the model to include. For example, identify any missing incident categories from the Incident classification solution.

If you are satisfied with the solution you have reviewed, it will already be active and ready to use if it is the latest version. If you are not satisfied, you can choose a different version of the solution and make it active. You could also tune the solution by configuring the class precision and coverage to use acceptable values.
Tune a trained solution

Tune the performance of a trained solution by configuring class level precision and coverage values.

- Role required: admin or ml_admin
- Train the solution definition whose output field values you want to configure.

The system creates a class record for each output field value that it can predict. Each class record includes a list of possible precision and coverage combinations to choose from. By default, solutions use the highest combination of precision and coverage available. You can select another combination to refine predictions based on acceptable precision and coverage values.

1. Navigate to Agent Intelligence Solutions.
   The system shows the list of available solutions.
2. Select the solution whose classes you want to configure.
   This solution must have a State of Solution Complete.
   The system shows the Solution record.
3. From the Class Confidence related list, select the class you want to configure.
   The solution only lists output field values for which it can make predictions. If the output field value is missing from this list, update the solution definition filter to provide more data for this output field value, and retrain the solution.
   The system shows the Class Confidence record.
4. Review the precision and coverage combinations available from the Precision Coverage Lookups embedded list.
5. Select the check box for the precision and coverage combination you want to use to make predictions of this class.
   You can only select one check box. Some combinations produce special prediction results.

   **Table 7: Special prediction combinations**

<table>
<thead>
<tr>
<th>Prediction result</th>
<th>Precision</th>
<th>Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never include class in predictions</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Always include class in predictions</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

6. From the Actions on selected rows control, select Apply Values.
   The system shows a Precision / Coverage Setting confirmation window.
7. Click OK to confirm the change or Cancel to discard it.

Test predictions of this class to verify that the system produces acceptable results.

Exclude a class from prediction

Exclude a class from prediction if its precision or coverage statistics do not meet your threshold of usefulness. For example, exclude it if you do not want the model to predict a particular output field value.

- Role required: admin or ml_admin.
- Train the solution definition whose output field values you want to exclude.

If the solution does not provide sufficient precision or coverage, you can exclude a particular incident category from prediction.
Excluding a class from prediction only lasts until the solution is next trained. If a class still does not provide sufficient precision or coverage values, you may want to consider deactivating the solution until it provides better results.

Typically, you exclude a class from prediction if you only want a person to manually set the excluded class value. For example, exclude the class if the solution does not offer sufficient precision or coverage, or because the class triggers other business logic that requires review or approval.

1. Navigate to Agent Intelligence Solutions.
   The system shows the list of available solutions.

2. Select the solution whose classes you want to exclude.
   This solution must have a State of Solution Complete.
   The system shows the Solution record.

3. From the Class Confidence related list, select the class you want to exclude.
   The system shows the Class Confidence record.

4. Review the precision and coverage combinations available from the Precision Coverage Lookups embedded list.

5. Select the check box for the 100 precision and 0 coverage combination.
   You can only select one check box.

6. From the Actions on selected rows control, select Apply Values.
   The system shows a Precision / Coverage Setting confirmation window.

7. Click OK to confirm the change or Cancel to discard it.

The solution excludes the class from all predictions until the next training cycle.

If you conclude this class will never produce meaningful predictions, consider deactivating the solution or changing the solution definition.

Activate solution version

The system activates the most recent version of the solution when it completes training a solution, and only allows one solution version to be active at a time. However, you can activate any previously trained solution version you want Agent Intelligence to use to make predictions.

- Role required: admin or ml_admin
- Manually train a solution multiple times or set a training schedule.

The system creates a solution version each time you train a solution definition. Typically, you only manually create a new solution version when you change the solution definition filter and want to test it. Otherwise, most solution versions are created during scheduled solution training.

1. Navigate to Agent Intelligence Solutions.
   The system shows a list of trained solutions.

2. Select the solution version you want to activate.
   The system shows the solution record.

3. Click Active.
   The system activates this solution version and deactivates any other solution version.

Review the trained solution precision and coverage statistics.
Export trained solutions to production

You can refine and test your ML solutions iteratively on a non-production instance, and then use update sets to export the changes to your production instance. This practice mitigates the risk of retraining solutions on your live production instance.

Prior to testing on a test instance, ensure that the instance hosts recently cloned data from your production instance so that the solutions you train on test continue to be valid when you export them to production.

Role required: admin or ml_admin

Plan your changes carefully, and remember that update sets match records based on the system ID [sys-id], and not the version number. For more information on update sets, see System update sets.

1. Navigate to Agent Intelligence Solution Definitions.
2. Click the name of your trained ML Solution Definition record to open it.
3. In the Related Links section, click Add solutions to the current update set.
4. Click Update.

Your trained ML solution artifacts, such as solution definitions, template records, and predictive model statistics, are added to the current update set.

Depending on where you are in your solution testing, schedule your update set for export to another non-production instance for further testing, or on to production.

Review prediction results over time

Use the Prediction Results dashboard to determine if solution predictions are improving over time. Identify solutions that require filter changes or retraining.

- Role required: admin, ml_admin, or ml_report_user
- To ensure optimal dashboard display, enable responsive dashboards or change the default dashboard layout.

The Prediction Results dashboard lists solution precision and coverage over time.

1. Navigate to Agent Intelligence Reports Prediction Results.
   The system shows the Prediction Results dashboard.
2. From Filter by solution, select the solution whose statistics you want to review.
   The system updates the dashboard based on the solution selected.
3. Identify classes with anomalous precision or coverage values.
   For example, identify solutions where the precision or coverage is decreasing over time.

Update the solution definition filter to include or exclude classes as needed.

Test a solution prediction

Once your machine-learning (ML) solutions are trained, you can call on the Agent Intelligence API to make a solution prediction. In this example procedure, we use the REST API Explorer to test a solution prediction for incident categorization.

Role required: web_service_admin, rest_api_explorer, or admin

Train your ML solution prior to testing a prediction.
This procedure uses sample data to illustrate what you can do in your instance, and may not represent data or records that are actually in your instance.

1. Write down and save the name of your ML solution definition.
   In this case, you would use the Name field value in your ML Solution Definition Incident Categorization record, as illustrated in the following example.

2. Write down and save the Input Fields type in your ML Solution Definition Incident Categorization record that you want the REST API Explorer to use in its call to the Agent Intelligence API.
   In this case, you would use the short _description field, as the prediction model has been trained to use this field to learn its category definition.
3. In your application navigator, navigate to System Web Services REST API Explorer.

4. Set these choice fields as follows.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Namespace</td>
<td>now (leave as default)</td>
</tr>
<tr>
<td>API Name</td>
<td>Agent Intelligence</td>
</tr>
<tr>
<td>API Version</td>
<td>latest (leave as default)</td>
</tr>
</tbody>
</table>

The Agent Intelligence form appears. You use this form to prepare your call request to the Agent Intelligence API.

5. In the solution-name Value field, type ml_incident_categorization.

**Note:** This is the Name value you captured in Step 1 of this procedure.

6. Click Add query parameter.
The Agent Intelligence form refreshes to show the Query parameters section. 
7. Type short_description in the first field.

   **Note:** This is the input field you captured in Step 2 of this procedure.

8. Type a short description of an incident in the second field. For instance, type Unable to connect.
9. Click the Send button.

   The REST API Explorer sends your request to the Agent Intelligence API.

   The system predicts the output value in the Response Body section of the API output. You can use
   other short descriptions to test what the solution is predicting.

10. (Optional) Send a different request to the Agent Intelligence API so you can test the prediction model
    again.

    a) Return to the Query parameters section of the Agent Intelligence form.

    b) Type a short description that references a different kind of incident in the second field. For
       example, type Unable to connect to MSSQL.

    c) Click the Send button.

   The Response Body section may refresh to show a different outcome than what you saw in Step
   9, depending on which incident categories you configured in your solution definition setup. In other
   words, changing the short description text can recategorize the incident as a different kind of issue.

You can also test the Agent Intelligence prediction model when you create a new incident
record using the incident form.

1. Navigate to Incident Create New.
2. In the new Incident form that loads, set the fields as follows.

   • User: Type the Caller name.
   • Category: Leave as default.
   • Short description: Type a short description that you want to test.

3. Submit the incident form.

   Result: When the form refreshes, an information message appears with the incident
category automatically set to a specific value.

   **Note:** For some short descriptions, the prediction might not process
because the solution does not have enough confidence in predicting the
value for this input.

---

**Preserve ML solutions during a system clone**

Save your trained machine-learning (ML) solution data during a system clone.

Role required: clone_admin or admin

The system stores trained ML solutions as Attachment records. These records include your solution
artifacts, such as solution definitions, template records, and predictive model statistics, all of which are
required components of the Agent Intelligence prediction functionality. To preserve these records, follow
the high-level steps below each time you run a system clone.

1. Enter `sys_properties.list` in the application navigator to access the System Properties list.
2. Ensure the glide.platform_ml.clone_artifacts system property is set to True.
3. If you want to preserve only the ML solution records and not the numerous other records in the sys_attachments table, exclude the sys_attachments table from your clone run.
4. Request a system clone.
The system preserves your ML solution records during the system clone.

Domain separation and Agent Intelligence

This is an overview of domain separation and the Agent Intelligence application. Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.

Overview

Support: Level 2

Agent Intelligence enables the creation of supervised machine learning solutions using historic datasets. A machine learning solution definition can be configured in Agent Intelligence per domain, which ensures that the data used by the solution is domain-specific data. After a solution is trained for a domain, the solution calls for a prediction to be made for resolution, depending on what that domain belongs to. For example, the solution might be an incident or case.

How domain separation works in Agent Intelligence

An instance owner can train a machine learning (ML) solution for each domain by creating a solution definition for each domain and training those solutions. In this way each solution uses data specific to the corresponding domain.

• Data can be domain separated
• Domain column is present for base system application tables
• Domain-specific configuration is managed by instance owner
• Tenant domains can manage their own application data
• Application properties are domain-aware when needed

Configuration tips for Agent Intelligence

If you encounter issues during your solution training and solution prediction, follow these suggested resolutions.
## Solution training

<table>
<thead>
<tr>
<th>Issue</th>
<th>Resolution or suggested action</th>
</tr>
</thead>
</table>
| The solution training remains in Waiting for Training status for too long, as the scheduler job is using an incorrect glide callback instance URL. | Ensure the glide.servlet.uri property in the Glide instance is set to the correct instance URL. This issue can occur when:  
  • An instance is cloned from production, yet it still refers to the production URL for the glide.servlet.uri property.  
  • The glide instance is provisioned and runs the training for the first time. |
| New categories have been added and are not yet having an impact on training. | This behavior is expected as the new categories need to bake until sufficient data exists for the new category and the solution is retrained. |
| The solution training fails.                                           | When the training fails, click the Show Training Progress related link on the solution screen to determine where the potential problem resides. |
| The solution training fails due to user authentication.                | Navigate to System Security> Users and ensure the sharedservice.worker role is set to Active.                                                                 |
| The model training returns saying the model cannot be created. The training fails and shows the “Error while training solution” message. The training progress window shows this message: “Solution training failed as either the data used is not sufficient or the input field is not predictive of the output field.” | This issue can occur when the data quantity or the distribution of field values is not sufficient for a model to build successfully. Follow these steps to troubleshoot:  
  1. Ensure that the distribution of the output field is not skewed.  
  2. Retrain the model by changing the date filters to use a larger amount of data.  
  3. If the input fields are not fully populated, add a filter to remove null records. |
<table>
<thead>
<tr>
<th>Issue</th>
<th>Resolution or suggested action</th>
</tr>
</thead>
<tbody>
<tr>
<td>The solution has data in multiple languages but the coverage and precision results are poor.</td>
<td>Use the following options to help improve your metrics.</td>
</tr>
<tr>
<td></td>
<td>Option 1: Update the processing language of the solution to the most prominent non-English language.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> English is applied by default for all datasets.</td>
</tr>
<tr>
<td></td>
<td>Option 2: If there is sufficient data for each language/region:</td>
</tr>
<tr>
<td></td>
<td>1. Add a filter criteria for a specific language/region where the primary language can be identified (Dutch, English, French, German, Japanese, or Spanish).</td>
</tr>
<tr>
<td></td>
<td>2. Generate a solution for each language/region and apply the proper processing language to each solution.</td>
</tr>
</tbody>
</table>

**Solution prediction**

<table>
<thead>
<tr>
<th>Issue</th>
<th>Resolution or suggested action</th>
</tr>
</thead>
<tbody>
<tr>
<td>The prediction fails and returns a Java exception where the cause is unknown.</td>
<td>1. Search for the exception in the Agent Intelligence Glide logs.</td>
</tr>
<tr>
<td></td>
<td>2. Submit an Incident record for Agent Intelligence including all relevant details, such as the exception, the impacted instance, the solution name, and the input string.</td>
</tr>
<tr>
<td>Issue</td>
<td>Resolution or suggested action</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| There is no prediction applied to the incident/case record but the prediction returns a value when tested in the Rest API Explorer. | This behavior can occur when the confidence of the prediction is less than the threshold required to make a prediction. After your solution is trained, use the following steps to confirm if your solution settings need adjusting.  
1. Navigate to System Web Services > REST > REST API Explorer to find the confidence level for the prediction. See Test a solution prediction on page 28.  
2. On your ML Solution Definition record, check the threshold set for your outcome class that was returned in the prediction by clicking the name of the class. The Class page appears.  
3. Check the Estimated Precision and Estimated Coverage values. If the corresponding threshold is more than the prediction confidence of the outcome, this is the root cause for why you did not see any prediction.  
4. Adjust the class precision and coverage values to increase coverage or precision. See Tune a trained solution on page 26. |

### Instance cloning

<table>
<thead>
<tr>
<th>Issue</th>
<th>Resolution or suggested action</th>
</tr>
</thead>
<tbody>
<tr>
<td>After an instance is cloned, predictions for your existing solutions fail.</td>
<td>The ML solution artifacts in the [ml_artifacts] table are stored in the [sys_attachment table]. If the [ml_artifacts] table is not included in the clone when you run it, the predictions fail. Ensure your clone includes the machine-learning artifacts, as these are critical components of your Agent Intelligence solution.</td>
</tr>
<tr>
<td>After an instance is cloned, the solution training fails.</td>
<td>As the cloning run proceeds, it is possible that the sharedservice.worker user has either been inactivated, locked out, or the user ID is not set. Resolve these problems so that the solution training succeeds.</td>
</tr>
</tbody>
</table>

### Configuration Management Database (CMDB)

With the ServiceNow® Configuration Management Database (CMDB) application, build logical representations of assets, services, and the relationships between them that comprise the infrastructure of your organization. Details about these components are stored in the configuration management database...
(CMDB) which you can use to monitor the infrastructure, helping ensure integrity, stability, and continuous service operation.

Use core features such as CMDB Health, CMDB Identification and Reconciliation, and CMDB CI Lifecycle Management to monitor and detect health issues, reconcile data integrity issues, and manage data lifecycle.

**Note:** CMDB modules, features, and wizards are not supported on mobile devices. You cannot use a mobile device to access the CI Class Manager, Query Builder, or Duplicate CI Remediator. Or to access or configure CMDB features such as Identification and Reconciliation, CMDB Health, CI Lifecycle Management, baseline CMDB, and proposed changes.

<table>
<thead>
<tr>
<th>Explore</th>
<th>Set up</th>
<th>Administer</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Configuration Management Database (CMDB) release notes</td>
<td>• Populate the CMDB on page 42</td>
<td>• Baseline CMDB on page 46</td>
</tr>
<tr>
<td>• Upgrade to London</td>
<td>• Whitepaper: CMDB Design &amp; Configuration</td>
<td>• CI relationships in the CMDB on page 52</td>
</tr>
<tr>
<td>• Configuration Management and the CMDB on page 37</td>
<td>• Whitepaper: CMDB Design</td>
<td>• CMDB classifications on page 70</td>
</tr>
<tr>
<td>• CMDB Identification and Reconciliation on page 105</td>
<td>• Whitepaper: Improving Configuration Item Data Quality</td>
<td>• Video: CMDB Health dashboard</td>
</tr>
<tr>
<td>• CMDB Health on page 148</td>
<td>• Whitepaper: CMDB Design Guidance</td>
<td>• CMDB 101 - What is a configuration management database and why do you need one? (ServiceNow® Community post)</td>
</tr>
<tr>
<td>• CMDB CI Lifecycle Management on page 94</td>
<td>• Activate the Extended CMDB plugins on page 222</td>
<td></td>
</tr>
<tr>
<td>• Domain separation in CMDB</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Use</th>
<th>Develop</th>
<th>Troubleshoot and get help</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Create a CI class on page 76</td>
<td>• CMDB APIs (CMDB SDK) on page 220</td>
<td>• Search the HI knowledge base for known error articles</td>
</tr>
<tr>
<td>• Create or edit a CI relationship on page 62</td>
<td>• Developer training</td>
<td>• Contact ServiceNow Support</td>
</tr>
<tr>
<td>• Add a proposed change to a CI on page 48</td>
<td>• Developer documentation</td>
<td></td>
</tr>
<tr>
<td>• Querying the CMDB on page 81</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Configuration Management and the CMDB

The Configuration Management data base (CMDB) creates and maintains the logical configurations your network infrastructure needs to support a ServiceNow service.

These logical service configurations are mapped to the physical layout data of the supporting network and application infrastructure in each of your respective domains. They track the physical and logical state of IT service elements and associate incidents to the state of service elements, which helps in analyzing trends and reducing problems and incidents.

The configurations are stored in a configuration management database (ServiceNow CMDB) which consists of entities, called Configuration Items (CI), that are part of your environment. A CI may be:

- A physical entity, such as a computer or router
- A logical entity, such as an instance of a database
- Conceptual, such as a Requisition Service

In each case, there are attributes about the CI that you want to maintain, and there is control you want to have over the CI. There are changes that may need to be made and tracked against the CI. Also, a CI does not exist on its own. CIs have dependencies and relationship with other CIs. For example, the loss of disk drives may take a database instance down, which affects the requisition service that the HR department uses to order equipment for new employees.

It is this relationship data that makes the CMDB a powerful decision support tool. Understanding the dependencies and other relationships among your CIs can tell you, for example, exactly who and what is affected by the loss of that bank of disk drives. When you find out that a router has failed, you will be able to assess the effect of that outage. When you decide to upgrade the processor in a server, you can tell who or what will be affected during the outage.

Configuration items differ from environment to environment because each customer has unique needs. Details about the exact physical attributes of a computer may be needed by one customer, but may represent meaningless data to another. The NOW Platform provides a mechanism to easily define new classes of configuration items and new relationships that may exist between CIs. New classes can be defined that extend other classes. For example, a laptop class exists that extends the computer class. The computer class itself extends the base CI class. Customer class extensions are automatically part of the ServiceNow environment and blend seamlessly into the integration points for other ITIL processes.

You can for example, set the Used for attribute in the cmdb_ci_server table to a value such as ‘development’, ‘test’, or ‘production’. These values indicate the environment that the CI is supporting, and serve as a way of tracking a CI through its lifecycle in a changing environment.
Architecture

Roles required
For viewing CMDB-related records in the user interface, the itil role is usually sufficient. For updating records and for other manipulation of records, roles with higher credentials are usually required, as noted.

Domain separation in Configuration Management Database (CMDB)
This is an overview of domain separation and the Configuration Management Database (CMDB). Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.
Overview

Support: Level 2

Domain separation is supported in this application. Not all ServiceNow applications support domain separation; some include limitations on the data and administrative settings that can be domain separated. To learn more, see Application support for domain separation.

The following topics provide details about domain separation in Configuration Management (CMDB) modules:

- Domain separation in CMDB Health on page 149
- Domain separation in CMDB Query Builder on page 82
- Domain separation in CMDB Identification and Reconciliation on page 105
- Domain separation in the relations formatter and the CI relationship editor on page 59
- CMDB APIs (CMDB SDK) on page 220

ITIL Configuration Management integration

The CMDB has relationships with IT service management processes in the following areas: ITIL incident management, ITIL problem management, ITIL change management, ITIL service catalog management, and financial management.

ITIL Incident Management

Configuration management assists Incident Management by providing the Service Desk with immediate information on the CIs affected, and more timely resolution of faults by understanding what CIs have been affected and changed.

ITIL Problem Management

Configuration Management assists Problem Management by linking the CIs affected by problems to the Incident / Problem / Change Management processes, and ensuring the CI status is properly maintained.

ITIL Change Management

Configuration Management assists Change Management by recording which CIs have been changed and controlling the status of CIs throughout the entire CI lifecycle. Configuration Management ensures any changes made to CIs are recorded and kept accurate.

ITIL Service Catalog Management

With Service Portfolio Management, business services in the CMDB can also be managed by the Service Catalog team, and exposed to end users who can then request items from them.

Financial Management

With Cost Management, costs can be associated with configuration items, so that the cost associated with Configuration Management can be tracked and bundled into expense lines, budgets, or cost centers.
**IT4IT**

*IT4IT* provides reference architecture about the implementation of ITIL strategy. For more information, see the ServiceNow Community blog *Running IT as a Business using IT4IT and ServiceNow*.

**ITIL**

The IT Infrastructure Library (ITIL) is an integrated, process-based framework for managing IT services. It provides guidance for creating and operating a Service Desk that provides efficient communication between the user community and the IT provider. Originally initiated to improve IT service management for the UK central government, it has become a standard for many organizations; public or private sector, large or small, centralized, or distributed.

ITIL provides processes for three service concepts: design, transition, and operation.

<table>
<thead>
<tr>
<th>Service concept</th>
<th>Processes</th>
</tr>
</thead>
</table>
| Design          | - service level management  
|                 | - availability management  
|                 | - capacity management  
|                 | - supplier management  
|                 | - service catalog management |
| Transition      | - change management  
|                 | - knowledge management  
|                 | - asset management  
|                 | - configuration management  
|                 | - release management |
| Operation       | - request fulfillment management  
|                 | - event management  
|                 | - incident management  
|                 | - problem management  
|                 | - facilities service automation |

**Service design**

This guide provides a general overview of ITIL service design concepts.

**Service level management**

The service level management process is designed to ensure customer satisfaction within IT service processes. Service level agreements are made between the IT staff and the customers, and the IT desk must monitor their performance as compared to the agreements. In addition, underpinning contracts with external vendors and operational level agreements with internal vendors ensures that these service level agreements are feasible.
**Availability management**

The availability management process ensures that availability within a system is kept as close to 100% as possible. By both reacting to past service failures, and planning to avoid future service failures, availability management can greatly increase end-user satisfaction with services.

**Capacity management**

The capacity management process is designed to ensure that business services are not made unavailable by over-capacity. By analyzing past failures and planning for growth of demand of services, capacity management can increase end-user satisfaction with services.

**Supplier management**

Supplier management is a process that defines and monitors agreements between an IT department and an external supplier.

**Service catalog management**

The service catalog provides a front end for customers to request items and services. Service catalog management ensures that this service catalog provides accurate and useful information on the items and services.

**Service transition**

This guide provides a general overview of ITIL service transition concepts and how the Now Platform can enable these processes.

**Change management**

The change management process ensures that standardized methods and procedures are used for efficient and prompt handling of all changes to minimize the impact of change related incidents on service quality. Consequently, change management aims to improve the day-to-day operation of the organization. IT-related changes that may affect one or many customers are tracked with change management. Adding memory to one machine, getting a new server, and installing the latest Windows OS on all PCs are all examples. To find out how the ServiceNow platform implements change management, see Change Management.

**Knowledge management**

The knowledge management process ensures that important information flows freely throughout the IT organization. Knowledge management keeps the CMDB and knowledge base of an organization up-to-date, and uses a knowledge-centered support approach to reduce repeat incidents and problems. For more information on how the ServiceNow platform implements knowledge management, see Knowledge Management.
Asset management

Asset management enables a process of monitoring processes, organizations, people, information, applications, infrastructure, and financial capital within an organization. This allows the organization to collect accurate records of these business components, making them available for both internal and external auditing processes. To find out how the Now Platform implements asset management, see Asset Management.

Configuration management

Configuration management provides a logical model of the infrastructure or a service by identifying, controlling, maintaining and verifying the Configuration Items in existence. To find out how the Now Platform implements configuration management, see.

Release management

This discipline of IT service management is the management of all software configuration items within the organization. It is responsible for the management of software development, installation and support of an organization’s software products. Software Control & Distribution procedures include the management of the software Configuration Items and their distribution and implementation into a production environment. This involves the definition of a release program suitable for the organization, the definition of how version control is implemented, and the procedures surrounding how software is built, released and audited. To find out how the Now Platform implements release management, visit Release Management.

Populate the CMDB

You can populate the CMDB by using Discovery, by importing information from another source, by integrating with an existing external CMDB, or by manually creating CIs.

When you populate the CMDB with information, you create a record for each configuration item in the cmdb_ci table or on one of the tables that extend that table.

ITIL configuration management auto-discovery

The key to any configuration management business practice is the initial and on-going inventory or discovery of what you own. The ServiceNow platform provides three options for auto-discovery:

- The separate and highly robust Discovery product.
- A lightweight native discovery tool, called Help the Help Desk, as part of the overall CMDB. Help the Help Desk enables organizations to proactively scan their network to discover all Windows-based PCs and the software packages installed on those PCs. This WMI-based discovery is included in the core ServiceNow functionality, in the Self Service application, at no additional cost.
- For organizations that want to leverage the discovery technologies they already have deployed (SMS, Tally NetCensus, LanDesk, and so on), the ServiceNow platform supports integrations to those technologies via web services. Scanned data can be mapped directly into the CMDB.

For further information on designing, constructing, and maintaining the CMDB, see white papers CMDB Design & Configuration and CMDB Design.
Discovery

The Discovery product automatically populates the CMDB. Discovery runs probes and sensors to collect information on hardware on the network, software running on that hardware, and the relationships between all the items found. This information is sent back to the ServiceNow instance, and is used to populate the CMDB.

![Discovery overview](image)

**Figure 2: Discovery overview**

Import information from another source

Information can be imported to the CMDB using import sets. *Import sets* find files of information (in formats such as XML, Excel, or CSV), import them, and transform them onto the required table. This process can be scheduled or performed on demand.

To import relationships between CIs, use import sets to populate the table [cmdb_rel_ci] with information on the parent, the child, and the nature of the relationship. The [cmdb_rel_ci] table displays a list of all CI relationships and is useful when importing CI data.
Integrate with an existing external CMDB

If the data required for the CMDB is already being collected by another CMDB, it is possible to collect the information from that CMDB in an automated process.
**CMDB instance API**

Use the *CMDB instance API* to populate the CMDB by creating or updating CMDB tables.

**Manually create a CI**

Create a single CI for a specific class. The role required is based on the selected table settings.

1. Use the CI Class Manager:
   a. Navigate to Configuration CI Class Manager.
   b. Click Hierarchy to display the list of CI Classes. Select the class to use for the CI.
   c. In the class navigation bar, select CI List and then on the CI list view, click New.
   d. Fill out the CI form and then click Submit.

2. Or, directly use a table:
a. Navigate to and expand Configuration and then elect the class to use for the CI, such as Business Services.

b. In the navigation filter of the application navigator, enter the table label (such as 'Linux'), or the table name in the format of <table name>.list (such as 'cmdb_ci_linux_server.list'). Then, press Enter.

c. In the list view of the table, click New and fill out the form fields for the table.

d. Click Submit.

Baseline CMDB

CMDB baseline provides capabilities that help you understand and control the changes that have been made to your configuration items (CIs) in the CMDB.

• You can create a baseline, which is a snapshot of your configuration items in the CMDB. You can review the changes that have been made to that configuration item since a previous baseline. Multiple baselines may be created and the system tracks the changes that have been made per baseline.

Creating a baseline captures the attributes of the CI as well as all first-level relationships for the CI. Any changes to the base CI or to any related CIs are captured and displayed. Newly created CIs are not automatically added to a baseline.

• Associate a configuration item with a task, a change or change task, and to propose changes to the CI after the change is complete. You can record changes, and these changes are not applied to the CI immediately but are delayed until the change is complete.

When the change is complete, you can choose to apply the proposed changes which makes all changes previously proposed and associates the changes with the task.

Create a CMDB baseline

You can create a baseline for a CI to track updates to the CI over time.

Role required: ecmdb_admin and itil

1. Navigate to Configuration Baselines Baselines.
   If the Baselines module is not visible in the Configuration application, the module is inactive. In that case append /sys_app_module.do?sys_id=f4463879a9fe3dba01b30bc100c9404 to the instance URL, and in the Module - Baselines form, ensure that the module is Active.

2. Click New.

3. Enter a Name for the baseline.
   By default, the cmdb_ci table is selected so that the record creates the baseline for all configuration items in the system.

4. To limit the baseline to specific CIs, select a different Table or choose Conditions that a CI must meet for it to have a baseline entry.
   For example, you might create a baseline for the Database table with the condition [Location] [is] [<configured location>].

5. Click Submit.
   The creation of a baseline is time consuming and occurs in the background. A message at the top of the record list notifies you that your baseline has been scheduled and you will receive an email when the process is complete.
Display baseline differences

You can see the changes that have been made to a CI or any first level related CIs by configuring the CI form layout to display the CMDB Baseline diff field. This field is labeled Baseline differences on the form.

Role required: itil

1. Open a CI record.
2. Select the baseline you want to see for this CI from the choice list. The field displays the details of any changes that were made to the current record for the selected baseline, or indicates that no changes were made.

<table>
<thead>
<tr>
<th>Baseline differences</th>
<th>For: SQL Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2009-09-14 14:46:49</strong> System Administrator</td>
<td>Changed: RAM (MB), Disk space (GB)</td>
</tr>
<tr>
<td>RAM (MB): 4 was: 100</td>
<td></td>
</tr>
<tr>
<td>Disk space (GB): 500 was: 100</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 5: Details of baseline differences**

3. To add a relationship to the CI, click the green plus icon in the Related Items toolbar. The new relationship appears below the toolbar. For more information about the Related Items toolbar and how to control the display, see CI relations formatter on page 56.

4. Update a related CI and see the changes displayed as Basic attribute changes in the current CI record.

<table>
<thead>
<tr>
<th>Baseline differences</th>
<th>For: SQL Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2009-09-14 15:17:42</strong> System Administrator</td>
<td>Changed: Sys audit, RAM (MB), Disk space (GB)</td>
</tr>
<tr>
<td>Storage Area Network 002 was: ApplicationServerPeopleSoft</td>
<td>(relationship added) - CI Relationship Change</td>
</tr>
<tr>
<td>RAM (MB): 4 was: -1</td>
<td></td>
</tr>
<tr>
<td>Disk space (GB): 500 was: 100</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 6: Basic Attribute Changes**

Managing proposed changes

The proposed changes feature allows you to pre-configure changes to configuration items and their associated relationships. These pre-configured changes are prepared to be implemented, but do not actually happen until they are applied at a later time.

When you view a CI, the proposed changes can be displayed so that you can see what is planned.

This feature is useful when you want to make modifications while a change process is in the approval stage, and only implement the changes after the approvals are complete. If the change is never approved, no changes to records have to be reversed. If the change is approved, a quick command applies all the proposed changes.
You can make the following proposed changes to a CI:

- Modify any field on the CI form.
- Add or delete a relationship to that CI.

To modify a relationship, you must delete the current relationship and add a new relationship. You cannot delete a proposed change.

**View CI history**

You can view the history of changes to a CI in a list, calendar, or timeline format.

**View the proposed changes of a CI**

You can view the proposed changes so that you can see what is planned for the CI.

**Role required: personalize_form**

To view any proposed changes, configure the CI form layout to display the CMDB Scheduled Changes field. Proposed changes are not displayed in a CI form by default.

1. Navigate to Change Open and open a change request.
2. In the Affected CIs related list, open the Configuration Item.
   - You may also navigate directly to the CI form.
3. Right-click the form header bar.
4. Select Configure Form Layout.
5. Move the CMDB Scheduled Changes field to the Selected pane.
6. Click Save.
   - The CI form shows the details of any proposed changes in the Scheduled changes area.

**Add a proposed change to a CI**

Proposed changes to a CI can be made while viewing a change request or any task-related record.

**Role required: itil**

1. In the Change Request form, go to the Affected CIs related list.
   - If there are no CIs in the Affected CIs list, click Edit to add CIs that are affected by this change request.
2. Right-click the CI that you want to configure for a proposed change, and select Proposed Change.
3. Complete the form to make the proposed changes, and click Save Proposed Change.
   - Click Update to apply the changes immediately. Click Delete to delete the CI.
4. To propose an addition or a removal of a CI relationship:
   a) Click the plus icon in the Related Items section.
   b) In the Relationships section, add or delete a relationship. For information about using the relationship editor, see Create or edit a CI relationship on page 62.
   c) Click Save Propose Change.
   d) Confirm saving the proposed change.

   Click Update or Delete to commit the changes immediately.
Note: Use only with CI relationships. Proposing additions or removal of relationships is not valid for user relationships and group relationships.

After the proposed changes are saved, the Apply Proposed Changes button appears on the Change Request form. This button lets the user commit the proposed changes to the CI. Your business processes determine the appropriate time to commit the changes. The CI retains the existing data until the proposed changes are committed. However, users can see that changes have been proposed.

Apply a proposed change to a CI

When you apply the proposed changes, all the proposed changes for that change request are applied to the configuration item. You can apply proposed changes without verification, or if verification tests of the proposed changes have failed.

Role required: itil

After you apply the proposed changes, the Scheduled changes part of the form displays No scheduled changes found. You can configure proposed change verification rules which you can use to verify proposed changes before applying the changes.

1. Navigate to the Change Request form.
2. Click the Apply Proposed Changes button.

You may have to right-click the form header and select the Reload Form option to see the changes.

Create or edit a proposed change verification rule

Ensure that proposed changes meet business requirements and do not introduce invalid data to the CMDB, create a rule that includes a script to verify the proposed changes.

Role required: asset or itil

When you configure proposed change verification rules for a CI, you have an option to verify that the proposed changes pass the verification test script in the rule. The verification test results are logged as passed or failed, and you can view the results. Running the verification test is not mandatory, and a failed verification test does not prevent you from applying proposed changes.

1. Navigate to Configuration Change Verification Proposed Change Verification Rules.
2. Click New or select an existing rule to edit.
3. Fill in the fields, as appropriate.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rule name</td>
<td>The name of this rule.</td>
</tr>
<tr>
<td>Table name</td>
<td>The table to which the rule applies.</td>
</tr>
<tr>
<td>Filter condition</td>
<td>Conditions to apply this rule to specific CIs.</td>
</tr>
<tr>
<td>Active</td>
<td>Check box to activate this rule.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Rule script</td>
<td>A verification Java script that needs to return true or false. For example:</td>
</tr>
<tr>
<td></td>
<td>validateRule()</td>
</tr>
<tr>
<td></td>
<td>{ var os = current.getValue(&quot;os&quot;); var cpu = current.getValue(&quot;cpu_count&quot;); }</td>
</tr>
<tr>
<td></td>
<td>//Use current.getValue(fieldName) to get the proposed change value, eg. var os = current.getValue(&quot;os&quot;);</td>
</tr>
<tr>
<td></td>
<td>//Your verification code</td>
</tr>
<tr>
<td></td>
<td>if (os != &quot;SunOS&quot;</td>
</tr>
<tr>
<td></td>
<td>//Return true to pass the verification and false if the verification failed</td>
</tr>
<tr>
<td></td>
<td>return true;</td>
</tr>
<tr>
<td></td>
<td>}</td>
</tr>
</tbody>
</table>

4. Click Submit or Update.

On the Change Request form, you can click Verify Proposed Changes to verify proposed changes for the affected CIs.

**Verify proposed changes**

Before applying proposed changes to affected CIs, use proposed change verification rules to verify that the changes meet business requirements and do not add invalid data to the CMDB.

Create or edit the rules used to verify proposed changes. For details, see *Create or edit a proposed change verification rule* on page 49.

Role required: none

You can apply proposed changes even if they are unverified or fail a verification test.

1. Open the Change Request form that affects the CI.
2. Click Verify Proposed Changes.
   - The proposed changes are verified against any proposed change verification rules in which the CI meets the Filter condition criteria.
3. Review the message that appears at the top of the form after the verification process is finished.
   - The message states whether the verification tests passed or failed.

To view the details of any verification tests that were performed for the change request in the past two days, click the Proposed Change Verification Log related link.
Create or edit a planned change validation script

Create a custom script that checks if a change to a class was valid according to business requirements, and whether the change was planned or not. A planned change validation script is used whenever a CI change is viewed in the CI timeline or change history.

Role required: admin or itil

The system attempts to validate each CI change as follows:

- If a custom script exists for the CI or one of the CI parents, then the script is executed and the results are used to flag the change as valid or invalid. Parent CIs are examined in the hierarchical order.
- If a custom script does not exist for the CI or any of its parents, then a predefined validation script is used. The change is determined as a planned change if the change occurred between the Work start and Work end dates of the change request associated with the changed CI.

However, this check is not always reliable because a user might have manually modified the CI within the work dates, which flags the change as valid even if it is invalid.

The script needs to return a boolean, true or false, which depends on meeting the test criteria in the script. You can define a separate script for each CI class, and you can define multiple planned change validation scripts for a single class. For example, to maintain different versions of the script. Only one script can be active for a CI class at any given time.

These are the parameters that uniquely characterize a change:

- The fields that were changed
- The data source that performed the change
- The time stamp of the change

To correctly determine the validity of a change, examine the parameters and apply business logic to evaluate if the validation tests are met. A planned change validation script can test any of these characteristics and determine when a change meets pre-established criteria. For example, the custom script can check if the mode of the CI is operational or maintenance, or who initiated the change.

1. Navigate to Configuration Change Verification Planned Change Validation Script.
2. Click New or select a validation script to edit.
3. Complete the form.

Table 9: Planned change validation script form

<table>
<thead>
<tr>
<th>Control</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>Check box to activate this script for validating changes.</td>
</tr>
<tr>
<td>Applies to</td>
<td>Class that this script applies to.</td>
</tr>
<tr>
<td>Script</td>
<td>Script to run to validate a change. If the script does not return a boolean value, then it is configured to false.</td>
</tr>
</tbody>
</table>

The script has a template which displays the input variables of the script.
Table 10: Template script input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>current</td>
<td>GlideRecord</td>
<td>Current record that is being processed.</td>
</tr>
<tr>
<td>updatedOn</td>
<td>GlideDateTime</td>
<td>Time stamp of the change.</td>
</tr>
<tr>
<td>updatedBy</td>
<td>String</td>
<td>Entity responsible for the change.</td>
</tr>
<tr>
<td>fieldsChanged</td>
<td>String</td>
<td>Comma-separated list of the names of all fields that were changed.</td>
</tr>
</tbody>
</table>

This sample script checks who initiated the record update. It returns true if admin initiated the record update. Otherwise, the script returns false.

```javascript
isValidChange();
function isValidChange(/*GlideRecord current, GlideDateTime updatedOn, String updatedBy, String changedFields*/)
{
    //Return true if the user that updated the record has an admin role
    return isUserAdmin(updatedBy);
}
function isUserAdmin(userName)
{
    var grUser = new GlideRecord("sys_user");
    grUser.addQuery('name', userName);
    grUser.query();
    if(grUser.next())
    {
        var roles = new GlideRecord("sys_user_has_role");
        roles.addActiveQuery();
        roles.addQuery('user', grUser.sys_id);
        roles.query();
        while(roles.next())
        {
            if(roles.role.name == 'admin')
                return true;
        }
    }
    return false;
}
```

4.  Click Submit.

CI relationships in the CMDB

The CMDB, in contrast to a static asset list, helps you track not only the configuration items (CIs) within your system, but also the relationships between those items.

A relationship in the CMDB consists of two CIs and a relationship type:

- Parent CI
- Child CI
• Type of the relationship that links both CIs

For example, in the [Server1] [Managed by] [Server2] relationship:

• Server1 is the child CI
• Server2 is the parent CI
• [Managed by] is the relationship type

For example, a web application might read data from an instance of Oracle, which in turn might depend on a piece of underlying hardware. Most CIs in a CMDB have multiple relationships to other CIs, users, and groups.

The relationships between CIs can be automatically discovered. If you use Discovery, many relationships can be automatically loaded into the system through the discovery process. If you import your data from another system, you get some form of relationships.

You can add to automatically discovered relationships, create relationships, or edit relationships for a CI by launching the CI relationship editor from the CI form.

Suggested class relationships

The system keeps a table (Suggested Relationship [cmdb_rel_type_suggest]) of relationship types that are appropriate for a CI type, based on its class. You can manage suggested relationships by navigating to Configuration Suggested Relationships, or in the CI Class Manager.

Suggestion model

The relationship editor has a base CI. The base CI designates the CI that a user was on before launching the editor, as the base CI in the new relationship. If you launched the relationship editor from the lnux100 CI, then lnux100 becomes the base CI. Also, every CI in the system has a type (class). For example, bond lnux100 is of the Linux server type.

Many CI types are children of other types in the hierarchy. For example, the class hierarchy for a Linux server is:

cmdb_ci -> cmdb_ci_computer -> cmdb_ci_server -> cmdb_ci_linux_server

The suggestion model works by analyzing the suggested relationship table for all relationships whose base class is the current base class of the user or any one of its parent classes. For example, looking at a Linux server, the suggestion model would retrieve any relationships whose base class was:

cmdb_ci_linux_server, cmdb_ci_server, cmdb_ci_computer, or cmdb_ci

The system automatically adds relationships that are used in Service Mapping and Discovery (if activated), to the Suggested Relationship table.

Suggested CI relationships in the relationship editor

The CI relationship editor uses the suggestion model to help users select reasonable relationships for configuration items.

For example, consider these relationship types in the system:

• Provides Power for :: Receives Power From
• Runs on :: Hosts
Typically, a user uses these relationships to define the following reasonable relationships between two items as follows:

- a database runs on a server
- a rack provides power for a server

Typically, neither of the following definitions would be appropriate:

- a rack runs on a server
- a server runs on a database

Add a suggested relationship

Add a suggested relationship for a class. The list of suggested relationships for a class is available when you create a new relationship for a CI of that class.

Role required: To view — itil. To create, update, or delete suggested relationships — itil_admin.

1. Use the CI Class Manager (Role required: itil_admin):
   a) Navigate to Configuration CI Class Manager.
   b) Click Hierarchy to expand the CI Classes list. Then select the class to add a suggested relationship to.
   c) In the class navigation bar, click Suggested Relationships.
   d) Click New.
   e) In the Add Suggested Relationship dialog box, select a Relationship and a Target Class for the relationship. This Class and the Target Class become parent or child in the suggested relationship, based on your selection of the Relationship.
   f) Click Save.

2. Or, navigate to Configuration Relationships Suggested Relationships (Role required: admin):
   a) Click New.
   b) Complete the form.

Table 11: Suggested Relationship fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base class</td>
<td>The base class in the relationship, which depending on the relationship type, is either the parent or the child in the relationship.</td>
</tr>
<tr>
<td>Relationship</td>
<td>Relationship type.</td>
</tr>
<tr>
<td>Dependent class</td>
<td>The dependent class in the relationship, which depending on the relationship type, is either the parent or the child in the relationship.</td>
</tr>
</tbody>
</table>
**Suggested relationship you can add**

<table>
<thead>
<tr>
<th>Base Class</th>
<th>Relationship</th>
<th>Dependent/Target Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oracle</td>
<td>Is Hosted On</td>
<td>Linux Server</td>
</tr>
<tr>
<td>Oracle</td>
<td>Is Hosted On</td>
<td>Solaris Server</td>
</tr>
</tbody>
</table>

**Note:** The same parent class and relationship can appear more than once.

You may need to delete a suggested relationship, for example, to limit the choice of available relationships in the CI relationship editor. Removing a suggested relationship does not affect relationships that are created or updated by Discovery.

**Relationship governance rules**

Relationship governance rules is a set of relationship rules used to ensure consistency and validity in modeling relationships between configuration items (CIs) in the CMDB. Use relationship governance rules to prevent the selection of relationship types or directions that are not allowed between specific CI types.

Different applications such as Discovery and Service Mapping, create relationships between CIs. Each application might use inconsistent relationship type or direction to represent the same entity, resulting in multiple views of the same CIs. Relationship governance rules define what are valid relationship types and valid directions between pairs of CI types resulting in valid and consistent relationships in the CMDB.

Relationship governance rules consist of:

- **CMDB dependent relationship rules** on page 126: Rules (hosting and containment rules) that are used for CI identification. You can view and modify dependent relationship rules in the CI Class Manager, after selecting a class from the class hierarchy and clicking Dependent Relationship.
- **Suggested relationships**: Rules that are based on existing suggested relationships in the Suggested Relationship [cmdb_rel_type_suggest] table. Suggested relationships are used in the CI relationship editor on page 61. You can view and modify suggested relationships in the CI Class Manager, after selecting a class from the class hierarchy and clicking Suggested Relationships.
- **Reference rules**: Rules that are used mostly by Cloud Management to represent all the possible valid combinations of pairs of referencing and referenced CIs in the service definition.
- **Built-in valid relationships**: The following relationships are pre-defined in the base system as valid relationships:
  - `cmdb_ci_endpoint -> Applicative Flow To::Applicative Flow From -> cmdb_ci_endpoint`
  - `cmdb_ci_endpoint -> Implement End Point To::Implement End Point From -> cmdb_ci`
  - `cmdb_ci -> Use End Point To::Use End Point From -> cmdb_ci_endpoint`

**General behavior**

- Relationship governance rules support inheritance.
  
  For example, suppose that the suggested relationship `cmdb_ci_appl Runs On::Runs cmdb_ci_hardware` exists. Then a `Runs On::Runs` relationship between a `cmdb_ci_appl_dot_net CI` and a `cmdb_ci_windows_server CI` is valid. That is because .Net Application class inherits from the Application class and the Windows Server class inherits from the Hardware class.
- Duplicate relationship governance rules are not allowed.
• Relationship governance rules are not domain separated.
• It is allowed to have more than one relationship type between the same two CI types.

For example, the following relationships are valid:
• cmdb_ci_appl Depends On::Used by cmdb_ci_service
• cmdb_ci_appl Receives data from::Sends data to cmdb_ci_service

Reports

A relationship between CIs is considered valid if it conforms to any of the relationship governance rules. Use the CMDB dashboard to view reports about overall relationships health including relationships compliance with relationship governance rules. The 'Relationships not compliant with all relationship rules' report shows CI relationships that are not compliant with any of the relationship governance rules.

CI relations formatter

The default CI form includes a CI relations formatter from which you can examine a CI and its relationships in various views. From the CI relations formatter, you can also launch the CI relationship editor for the CI.

If the domain separation plugin is activated, then only relationships in which the logged on user is authorized to view both CIs, are displayed.

The CI relations formatter contains a list of related CIs and a toolbar with controls for viewing the relationships between the current CI and related CIs. You can configure the controls in this formatter to modify varying aspects of the view. For more information about formatters, see Create a formatter and add it to the form.

Note:
• If an endpoint is a child in one relationship and the same endpoint is a parent in another relationship, then that endpoint is hidden and does not appear in the relations formatter view. Similarly, relationship qualifier chains are also hidden and do not appear in the relationship formatter view.
• Example: CI1 > endpoint > CI2
  In this example, CI1 is related to CI2 through relationships with endpoint. A single relationship appears in the relations formatter:
  CI1 > CI2 (These relationships appear as a direct relationship without endpoint, because endpoint is a parent in one relationship and a child in another relationship)
• Example: CI1 > endpoint1 > CI2 > endpoint2
  Two relationships appear in the relations formatter:
  CI1 > CI2 (endpoint1 is hidden because it is a parent in one relationship and a child in another relationship)
  CI1 > CI2 > endpoint2 (appears as level 2 relationship – endpoint1 is hidden and endpoint2 appears as it a child and not a parent in any other relationship)
• On instances that do not meet the internet browser requirements for the CI relations formatter, the default CI form includes the legacy CI relations formatter instead. For more information, see Legacy CI relations formatter on page 60.
• CIs not extended from the Configuration Item [cmdb_ci] table, are not displayed in Dependency Views maps and in CI relation formatters.
- The Applicative Flow To::Application Flow From relationship is a special relationship type used only between Service Mapping endpoints. This relationship type is not intended for use in the CMDB as a relationship between CIs and therefore it is not displayed in the relations formatter.

### Table 12: Controls for viewing related CIs

<table>
<thead>
<tr>
<th>Control</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add CI relationship</td>
<td>Starts the relationship editor to manually create CI relationships. For more information, see <em>Create or edit a CI relationship</em> on page 62.</td>
</tr>
<tr>
<td>Show dependency views</td>
<td>Launches a Dependency Views map in another window or tab. The CI is the central node in the map, with a configurable number of levels above and below that node in the hierarchy. Map indicators next to the nodes indicate the number of tasks, incidents, problems, changes, or outages related to that node. Right-click to expand collapsed nodes or display a list of related tasks or problems. For more information, see <em>Dependency Views map</em>.</td>
</tr>
<tr>
<td>Search for CI</td>
<td>Filters the CIs included in the display.</td>
</tr>
</tbody>
</table>

Click the Settings icon to configure additional view settings that filter the data displayed. Settings are preserved through logging out and logging back in.

### Table 13: Related items settings

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Show Relations in Flat/Tree Layout</td>
<td>To view a flat list of related CIs that are grouped by relationship type in alphabetical order, click Flat. To view groups of related CIs in a hierarchical tree, click Tree. If you select the tree view, you cannot configure any other settings for viewing related CIs. A single list of upstream and downstream relationships is displayed.</td>
</tr>
<tr>
<td>Show Relations in Split/Merge Layout</td>
<td>To view separate lists for upstream and downstream relationships, click Split. To view a single list that includes both upstream and downstream relationships, click Merge. Relationships are grouped by relationship type.</td>
</tr>
<tr>
<td>Setting</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Filter Relations by Max Level</td>
<td>Select the number of levels in the hierarchy to include when displaying CIs in a flat view.</td>
</tr>
<tr>
<td>Filter Relations by Relationship Type</td>
<td>Select the types of relationships to view.</td>
</tr>
<tr>
<td>Filter Relations by CMDB View</td>
<td>Filter by tables specified in CMDB views, if any relationship filters exist.</td>
</tr>
</tbody>
</table>

The relations formatter uses the following icons to provide additional information about changes, problems, and outages related to CIs in the relationship:

### Table 14: Icons related to CIs

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>![recently-closed-changes]</td>
<td>Recently closed changes</td>
</tr>
<tr>
<td>![planned-changes]</td>
<td>Planned changes</td>
</tr>
<tr>
<td>![currently-open-changes]</td>
<td>Currently open changes</td>
</tr>
<tr>
<td>![recently-closed-outages]</td>
<td>Recently closed outages</td>
</tr>
<tr>
<td>![problems]</td>
<td>Problems</td>
</tr>
<tr>
<td>![incidents]</td>
<td>Incidents</td>
</tr>
<tr>
<td>![planned-outages]</td>
<td>Planned outages</td>
</tr>
<tr>
<td>![currently-open-outages]</td>
<td>Currently open outages</td>
</tr>
</tbody>
</table>

In large networks, a list of related CIs might be excessively long, which can slow performance when a CI form is rendered. You can configure these properties to control the amount of data that is displayed. To find a property, enter `sys_properties.list` in the left navigation filter and search for the property.

### Table 15: Properties related to performance

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>glide.ecmdb.find_relationship_issues</code></td>
<td>Hides or displays an icon in the CI relations formatter that links to open issues for the CI. This property defaults to true (displays the icon).</td>
</tr>
<tr>
<td><code>glide.ui.max_relation_levels</code></td>
<td>Specifies the maximum level for displaying CIs in flat view before reaching the maximum relations limit. The default value is 5.</td>
</tr>
</tbody>
</table>
## Property Description

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.ui.max_relations</td>
<td>Specifies the maximum number of related CIs to display. When exceeded, a notification is displayed indicating that the limit has been reached, and that not all relations are displayed. The default value is 1000.</td>
</tr>
</tbody>
</table>

### Domain separation in the relations formatter and the CI relationship editor

This is an overview of domain separation as it pertains to the relations formatter and the CI relationship editor. Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.

### Overview

Domain separation is supported in this application. Not all ServiceNow applications support domain separation; some include limitations on the data and administrative settings that can be domain separated. To learn more, see [Application support for domain separation](#).

### How domain separation works in the relations formatter and relationship editor

- **Relations formatter**
  
  The relations formatter is domain-separation supported. The relations formatter is used to display CMDB relationships in the UI in different views. Since the CI Relationship (cmdb_rel_ci) table is not domain separated, relationships are visible in the relations formatter only if both parent and child CIs (cmdb) are visible in the domain.

  The CI Relationship Type (cmdb_rel_type) table is not domain separated. Therefore, in the relations formatter, all the relationship types are available to be selected as a filter.

  By default domain separation is supported in the relations formatter.

- **Relationship editor**
  
  The relationship editor is domain-separation supported. You can use the relationship editor to add new relationships or delete existing relationships for the current CI.

  - The CI relationship editor displays a list of CIs to add or remove from relationships. Since they are domain separated, the CI list view in the relationship editor displays the CIs that are visible to the current domain.

  - The CI relationship editor displays a list of relationships to add or remove. Since the CI Relationship [cmdb_rel_ci] table is not domain separated, the relationships list view displays all the relationships of the current CI.

  The Suggested Relationship (cmdb_rel_type_suggest) table is not domain separated, which means that all the suggested relationship types in the relationship editor are visible for all domains.

  By default domain separation is supported in the relationship editor.

### Create or edit a relationship filter

Create a custom relationship filter to display CI relationships from selected tables in the CI relations formatter.
Role required: ecmdb_admin

The CI relations formatter displays related CIs for the base CI, and the relationships between the CIs. You can use relationship filters on the CI relations formatter to customize CI relationship views.

1. Navigate to Configuration Relationships Relationship Filters.
2. Click New or select a filter to edit.
3. Enter or edit the relationship filter name.
4. Right-click the form header and click Save.
5. In the Configuration Types section, click Edit.
6. On the Edit Members form, select the tables of the CIs that you want to show with the filter and then move the tables to the Configuration Types list.
7. Click Save.

On a CI form, in the relations formatter settings, you can select the newly defined relationship filter from the Filter Relations by CMDB View list.

In the legacy CI relations formatter, you can click View and select the newly defined relationship filter.

After you select a filter, the relations formatter displays only CIs from the tables specified in the filter or from descending tables.

Exclude relationships from the relations formatter view

Create a list of relationships that should not appear in the relations formatter view on CI forms.

Role required: ecmdb_admin

1. Navigate to Configuration Relationships Relationship Type Exclusion List.
2. In the CI Relation Filters list view, click New.
3. Fill out the CI Relation Filter form to specify the relationship that you want to exclude from view.
4. Click Submit.

Excluded relationships do not appear in Related Items on CI forms.

Legacy CI relations formatter

On instances that do not meet the internet browser requirements for the latest CI relations formatter, the default CI form includes the legacy CI relations formatter instead.

This element contains the list of related CIs and a toolbar with controls for viewing the relationships between the current CI and related CIs.

Figure 7: Related items field

Note: The legacy BSM map provides a more complete view of CI relationships.

Configure the controls in this formatter with two properties that restrict varying aspects of the view.

Flat layout

Click the flat layout icon ( ) to group the related CIs by relationship.
Tree layout

Click the tree layout icon ( ) to group the related CIs in a hierarchical tree.

CI relationship editor

Use the CI relationship editor to create CI relationships.

When you use the relationship editor, the CI from which the editor was launched is designated as the base CI. You can then select one or more CIs as a second CI for the relationship. Depending on the selected relationship type, the base CI can become the parent CI or the child CI in the new relationship.

The relationship editor operates differently, depending on whether you select the Use suggested relationship check box.
• With suggested relationships, the relationship editor lists all available relationship types for the base CI. To define a new relationship, select a relationship type, and then select a second CI for the relationship.

  Suggested relationships are highlighted for you. These relationships are displayed in blue with a prefix of [Suggested].

• Without suggested relationships, you define a new relationship by first selecting a second CI for the relationship and then selecting a parent or a child relationship type.

  **Note:** The following relationship types are used only for Service Mapping endpoints, and you cannot use them as a relationship type between two CIs:

  • Implement End Point To: Implement End Point From
  • Use End Point To: Use End Point From
  • Applicative Flow To: Applicative Flow From

**Suggested relationships**

If you select the Use suggested relationship check box in the editor, the Suggested relationship list appears. It displays all available CI, user and group relationship types for the base CI. Relationship types have a suffix of (Parent) or (Child) to note the relationship descriptor, and suggested relationship types are displayed in blue and have a "*" prefix.

When you select a relationship, you are also designating the base CI as being the parent or the child CI in the new relationship. For example, if you select the 'Feeds' relationship type, the base CI becomes the designated parent CI, and the second CI that you select becomes the child CI in this relationship.

**Downstream relationships**

If you do not select the Use suggested relationship check box in the editor, the Downstream relationships list appears. It displays all relationships in which the base CI is the parent CI. The child CI of the relationship is displayed in the Child column.

**Upstream relationships**

If you do not select the Use suggested relationship check box in the editor, the Upstream relationships list appears. It displays all relationships in which the base CI is the child CI. The parent CI in each relationship is displayed in the Parent column.

**Supported browsers for the relationship editor**

You must use supported browser versions in order to use the latest CI relationship editor. If you do not use a supported browser version, the instance provides the legacy CI relationship builder.

• Firefox version 20 and up
• Chrome version 25 and up
• Safari version 6 and up
• Internet Explorer version 9 and up

**Create or edit a CI relationship**

Use the relationship editor to view, create or modify CI relationships. You can open the relationship editor from the CI Relations formatter.
Role required:

- To create relationships: ITIL or asset
- To view relationships, depending on the state of the Table API ACL:
  - If inactive (default): ITIL or asset
  - If active: ITIL or asset, and snc_platform_rest_api_access

For more information, see REST API security and Table API.

The relationship editor operates differently, depending on whether you check the Use suggested relationship option or not.

1. Launch the relationship editor:
   a) Open a CI form.
   b) Locate the Related Items section near the center of the form.
   c) Click the plus (+) icon on the Related items section.

2. To use suggested relationships, first select a relationship type, and then select one or more CIs to be the child CIs in the relationship:
a) Select Use suggested relationship.
b) From the Suggested relationship type list, select a relationship type. You can filter the list of suggested relationships by using the filter check boxes.

<table>
<thead>
<tr>
<th>Filter option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hide CI relationship</td>
<td>Hides any relationships between the base CI and another CI (such as &quot;Receives data from&quot;). Default filter is stored in the ci_manage_relationships_filter_hint.cmdb_ci user preference.</td>
</tr>
<tr>
<td>Hide user relationship</td>
<td>Hides any relationships between the base CI and a user (such as &quot;Logs reviewed by&quot;). The default filter is stored in the ci_manage_relationships_filter_hint.sys_user preference.</td>
</tr>
<tr>
<td>Hide group relationship</td>
<td>Hides any relationships between the base CI and a group (such as &quot;Backups done by&quot;). Default filter is stored in the ci_manage_relationships_filter_hint.sys_user_group user preference.</td>
</tr>
</tbody>
</table>

The Configurations Items list displays all the CIs that are appropriate for the base CI and the selected relationship type. The Relationships list at the bottom of the editor, displays all existing relationships of the selected relationship type, in which the base CI is a parent CI or a child CI.

c) From the Configuration Items list, select one or more CIs as a second CI for the relationship. You can filter the list of Configurations Items by adding conditions in the Filter section and clicking Run filter.

If you selected a parent relationship type, these CIs becomes the child CI in the relationship, and if you selected a child relationship type, then the selected CIs become the parent CI in the relationship.

d) In the Relationships section, click the plus icon (+) to add the new relationships. Alternatively, you can drag the selected CIs to the Relationships list. Each new relationship will consist of the base CI, the selected relationship type, and a selected second CI.

3. To not use suggested relationships, first select one or more CIs to be the child CIs in the relationship, and then select the relationship type:
a) Clear Use suggested relationship.

b) In the Configuration Items list, select one or more CIs as a second CI for the relationship. You can filter the list of Configuration Items by adding conditions in the Filter area and clicking Run filter. Depending on the relationship type that you will select, the selected CIs might become a parent or a child CI in the relationship.

c) With at least one CI selected in the Configuration Items list, click the ‘+’ sign in the Downstream Relationships section or the Upstream Relationships section to create the relationship.

- Add the relationship to Downstream Relationships to create a relationship in which the base CI is the parent CI and the selected CI is the child CI.
• Add the relationship to Upstream Relationships to create a relationship in which the base CI is the child CI and the selected CI is the parent CI.

d) For each newly created relationship in either the Downstream Relationships or the Upstream Relationships lists, click Please select a relationship and select a relationship type.
  • The list of available relationship types in the Downstream Relationships list contains parent relationships only, in which the base CI is the parent CI.
  • The list of available relationship types in the Upstream Relationships list contains child relationships only, in which the base CI is the child CI.

e) Click Save or Save and Exit.
  Only after you enter all the information that is necessary for creating the relationship, these buttons light up indicating that there are pending updates that require saving.

Legacy CI relationship builder

Used to define CI relationships manually, this page is a sophisticated version of the standard slushbucket.

In the legacy CI relations formatter, click the CI relationship builder icon (++) to display the legacy Define Relationships page.

Select a CI relationship type

The top half of the legacy relationship editor contains a large option box that allows you to select which type of relationship you want to manipulate. Click the particular type of relationship you are interested in working with.

Filter the list of CI relationships

In the legacy relationship editor, the checkboxes along the right hand edge of the select box provide a quick way to filter down the list of available relationships.

By default, the system displays a list of all suggested relationships for the type of CI you selected. For example, if you selected a Database instance, a relationship of "Runs on" makes sense, but a relationship of "Provides HVAC for" does not. The default filter is stored in the user preferences ci_manage_relationships_filter_hint.cmdb_cici_manage_relationships_filter_hint.sys_user, and ci_manage_relationships_filter_hint.sys_user_group.

• Hide CI relationship -- Hides any relationships between this CI and another CI (e.g. "Receives data from").
• Hide user relationships -- Hides any relationships between this CI and a user (e.g. "Logs reviewed by").
• Hide group relationships -- Hides any relationships between this CI and a group (e.g. "Backups done by").
• Show all relationships -- If you have the appropriate role (out of the box this is itil_admin) you will have an additional checkbox labeled "Show all relationships." If you click that checkbox, the system will let you choose any relationship defined in the system, regardless of where it is on the "suggested" list for this type of CI.
Select CI relationship targets

In the legacy relationship editor, users can link or unlink CIs for a relationship type.

As soon as you pick a relationship type, the system will fill in the two select boxes at the bottom of the screen with CIs that are appropriate for the relationship you suggested. The left hand select box will contain a list of CIs that might reasonably be linked via this relationship, while the right hand box contains a list of those CIs which are already linked.

1. Link or unlink items.

| Link new items                  | Move that CI from the left hand box to the right hand box. |
| Unlink existing items           | Move them from the right hand box to the left.               |

Result: When you make either type of change, a message appears indicating that you have pending changes.

2. Apply or cancel your changes.

| Click the Save button.            | This will save your set of changes, and go back to the previous screen (either a CI or the BSM map depending on how you got here). |
| Click the Cancel button.          | This causes you to exit without saving your changes.         |

Relation qualifier

A relation qualifier, which is a CI of the Qualifier [cmdb_ci_qualifier] type, stores important information about the CI relationships.

In a relation qualifier, you can annotate arbitrary unique information about the relationship between two CIs. You can define multiple qualifiers for a single relationship, resulting in a qualifier chain. But, there can be only a single qualifier chain for a specific relationship type between two CIs.

For example, for a relationship between a parent CI and a child CI, you can add a relation qualifier to note that the relationship was discovered based on traffic (such as cmdb_ci_qualifier_trafficbased). This results in having two records in the CI Relationship [cmdb_rel_ci] table for the relationship:

- A record that links the parent CI and the new qualifier
- A record that links the new qualifier and the child CI

For this relationship, there is a parent CI and a child CI, and a relation qualifier of type cmdb_ci_qualifier_trafficbased.

For information about usage of relation qualifiers in the identification process, see [CMDB identification rules](#) on page 111.

CI relationship security

When applying security to CI relationships, it is important to apply the access controls both to the CI Relationship (cmdb_rel_ci) table and to create an operation editCIRelations to the * table as well.
If the current instance has defined security for editCiRelations, it will be applied to edit_ci_relations automatically in the process of upgrading, and the out-of-date security will be removed.

Create a CI relation rollup

A CI relation rollup allows you to sum, count, max, min, or mean a relationship type. You can create CI relation rollups.

Role required: ecmdb_admin

CI relation rollup can be useful for tracking and for receiving notifications. For example:

• In a sum roll up, add up fields from multiple CIs and display the result on another CI to which they are related. So, if you have four configuration items in a rack that are all consuming power, create a CI relation rollup to add all the power usage together and display the result in one field on the rack CI form.
• If a certain level of power consumption in a rack is exceeded, send a notification.
• With a rack that has 10 slots, send a notification when 9 slots are filled.

CI relation rollups use the cmdb synch event business rule on the [cmdb_ci] table. Although this business rule is active by default, you must modify the rule slightly before it will run.

1. Navigate to Configuration Relationships CI Relation Rollups.
2. Click New.
3. Complete the form.

Table 16: CI Relationship Rollup fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CI Relationship Type</td>
<td>Select a relationship type from the list to use with the rollup. For example, Members::Member of contains the parent descriptor Members and the child descriptor Member of.</td>
</tr>
<tr>
<td>Type</td>
<td>Select the type of rollup from the drop-down list: COUNT, MAX, MEAN, MIN, or SUM.</td>
</tr>
<tr>
<td>Parent field</td>
<td>The target field on which the operation will be done.</td>
</tr>
<tr>
<td>Child field</td>
<td>The input to the equation type. The Parent field is affected by the selections in the Child field.</td>
</tr>
<tr>
<td>Rollup class</td>
<td>The classes that can use the relationship. For example, you can specify that the relationship only applies to racks.</td>
</tr>
</tbody>
</table>

4. To run the cmdb synch event business rule, navigate to Business Rules.
5. Use the search box to find the [cmdb synch event] table.
6. Click the cmdb synch event business rule to go to the Business Rule page.
7. Select the Update, Delete, and Query check boxes.

Additionally, if you wish CI relation rollups to recalculate when there is a change to a relationship, use a similar procedure to select the Active check box on the cmdb_rel_ci synch event business rule.
CMDB classifications

CMDB classifications are groups of configuration items (CIs) that share attributes and are stored in their own table. Classifications allow administrators to define the hierarchy of CIs within the CMDB. A CI class refers to the actual table name in the instance database. In that context, CI Type is a friendly name that a CI is known by, such as computer, router, or printer.

As good practice, keep CI classifications as simple as possible.

Configuration Management Database

The Configuration Management Database (CMDB) is a series of tables that contain all the assets and business services controlled by a company and its configurations.

This information includes computers and devices on the network, software contracts and licenses, business services, and more. The IT desk can use the CMDB to better understand their network users’ equipment, and the relationships between them. The CMDB can also be referenced by other processes within the system.

The CMDB can be populated using the Discovery product. Discovery searches the network for all attached computers and devices, then populates the CMDB with information on each computer/device’s configuration, provisioning, and current status. Discovery also reports on any software which is running, and the TCP connections between computer systems, thereby establishing their relationships.

Applications such as Asset Management, Software Asset Management, Contract Management, and Configuration Management contain modules which display different tables within the CMDB. Each application is designed with a specific purpose in mind.

Asset Management and Software Asset Management link to CMDB all assets, hardware, software, assets in stock, as well as records for manufacturers and vendors. The Contract Management application contains information about contracts, including leases, service contracts, purchase orders, warranties, and software licenses. The Configuration Management application has a focus on operation.

For more background information about the CMDB, see the ServiceNow® Community post at CMDB 101 - What is a configuration management database and why do you need one?

CMDB tables

Key tables in the configuration management database (CMDB):

- The Base Configuration Item [cmdb] table, which is the core CMDB table for non IT CIs (descending classes are non IT CIs).
- The core Configuration Item [cmdb_ci] table, which stores the basic attributes of all the CIs. The admin, itil, or asset user role is required to access this table (descending classes are IT CIs).
- The CI Relationship [cmdb_rel_ci] table, which defines all relationships between CIs.

The Configuration Item table is extended to other tables, such as Database [cmdb_ci_database] and Computer [cmdb_ci_computer]. The Computer table is extended to the Server [cmdb_ci_server] table, which is extended to the UNIX Server [cmdb_ci_unix_server] table, and so on.

**Note:** The Base Configuration Item [cmdb] table uses the table per partition extension model, which has different behaviors for replicating and deriving information than other extended tables. See Table extension and classes.

You can use the schema map to view more details of tables and their relationships:

1. Navigate to System Definition Tables & Columns.
2. Select a table and click Schema Map.

![Schema Map Diagram]

**Figure 10: Schema Map**

**Note:** CIs not extended from the Configuration Item [cmdb_ci] table, are not displayed in Dependency Views maps and in CI relation formatters.

**CI attributes**

Attributes apply to all the CIs in a classification. To change attributes for a CI, you must extend the table and create a new classification for that CI.
The position of a CI in a classification hierarchy is determined by the attributes it shares with the CIs below it. Each time a CI has a single different attribute from its parent, the classification hierarchy branches.

For example, servers have different attributes from computers, which include workstations and laptops. Linux servers and UNIX servers have different attributes from the parent server classification and from each other, so they occupy separate branches in the hierarchy.

**CMDB table attributes description**

Descriptions of the attributes in the Base Configuration Item [cmdb] table, and in its first level extended table Configuration Item [cmdb_ci].

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset</td>
<td>Reference field to the Asset table</td>
</tr>
<tr>
<td>Asset tag</td>
<td>Asset tag/service tag for the specific asset</td>
</tr>
<tr>
<td>Assigned</td>
<td>Date and time of assignment to user</td>
</tr>
<tr>
<td>Assigned to</td>
<td>Reference field to the User table</td>
</tr>
<tr>
<td>Assignment group</td>
<td>Reference field to the Group table</td>
</tr>
<tr>
<td>Checked in</td>
<td>Date and time of checking in</td>
</tr>
<tr>
<td>Checked out</td>
<td>Date and time of checking out</td>
</tr>
<tr>
<td>Class</td>
<td>System class name</td>
</tr>
<tr>
<td>Company</td>
<td>Reference field to the Company table</td>
</tr>
<tr>
<td>Cost</td>
<td>Financial value in local currency (as defined in the Cost Currency field)</td>
</tr>
<tr>
<td>Cost center</td>
<td>Reference field to the Cost Center table</td>
</tr>
<tr>
<td>Cost currency</td>
<td>Name of currency (such as dollars, pounds, Euros)</td>
</tr>
<tr>
<td>Created</td>
<td>Date and time record was created</td>
</tr>
<tr>
<td>Created by</td>
<td>Name of person/data source which initially created the record</td>
</tr>
<tr>
<td>Department</td>
<td>Reference field to the Department table</td>
</tr>
<tr>
<td>Domain</td>
<td>ID of the domain to which the instance belongs</td>
</tr>
<tr>
<td>Domain Path</td>
<td>Path of the domain to which the instance belongs</td>
</tr>
<tr>
<td>Due</td>
<td>Date and time instance was due</td>
</tr>
<tr>
<td>Due in</td>
<td>Description of the manner of which the instance was due</td>
</tr>
<tr>
<td>GL account</td>
<td>General Ledger account name/number</td>
</tr>
<tr>
<td>Installed</td>
<td>Date and time instance was most recently installed</td>
</tr>
<tr>
<td>Invoice number</td>
<td>Invoice number used in acquisition process</td>
</tr>
<tr>
<td>Attribute</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>Justification</td>
<td>Description of the justification for the instance</td>
</tr>
<tr>
<td>Lease contract</td>
<td>Number of current leasing contracts</td>
</tr>
<tr>
<td>Location</td>
<td>Reference field to the Location table</td>
</tr>
<tr>
<td>Managed by</td>
<td>Reference field to the User table</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>Reference field to the Company table</td>
</tr>
<tr>
<td>Model ID</td>
<td>Reference field to the Product Model table</td>
</tr>
<tr>
<td>Name</td>
<td>Name of the CI instance</td>
</tr>
<tr>
<td>Order received</td>
<td>Date and time instance was initially received</td>
</tr>
<tr>
<td>Ordered</td>
<td>Date and time instance was initially ordered</td>
</tr>
<tr>
<td>Owned by</td>
<td>Reference field to the User table</td>
</tr>
<tr>
<td>PO number</td>
<td>Purchase order number used in acquisition process</td>
</tr>
<tr>
<td>Purchased</td>
<td>Date instance was purchased</td>
</tr>
<tr>
<td>Requires verification</td>
<td>Flag indicating whether verification is required for the instance</td>
</tr>
<tr>
<td>Serial number</td>
<td>Serial number of the instance</td>
</tr>
<tr>
<td>Skip sync</td>
<td>Flag indicating whether synchronization between Asset Management and CMDB can be skipped</td>
</tr>
<tr>
<td>Status</td>
<td>Configurable choice list with values for current functional states</td>
</tr>
<tr>
<td>Support group</td>
<td>Reference field to the Group table</td>
</tr>
<tr>
<td>Sys ID</td>
<td>ServiceNow Sys ID (GUID)</td>
</tr>
<tr>
<td>Tags</td>
<td>Related tags</td>
</tr>
<tr>
<td>Updated</td>
<td>Date and time instance was last updated</td>
</tr>
<tr>
<td>Updated by</td>
<td>Person/data source which last updated the record</td>
</tr>
<tr>
<td>Updates</td>
<td>Configurable choice list with values for update states</td>
</tr>
<tr>
<td>Vendor</td>
<td>Reference field to the Company table</td>
</tr>
<tr>
<td>Warranty expiration</td>
<td>Date current warranty expires</td>
</tr>
</tbody>
</table>

Table 18: Configuration Item [cmdb_ci] table

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approval Group</td>
<td>Reference field to the Group table</td>
</tr>
<tr>
<td>Attributes</td>
<td>Description of usage of attributes for the instance</td>
</tr>
<tr>
<td>Can Print</td>
<td>Indicates whether the instance can print</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Category</td>
<td>Name of category applicable to the instance</td>
</tr>
<tr>
<td>Comments</td>
<td>Comments related to the instance</td>
</tr>
<tr>
<td>Correlation ID</td>
<td>ID of the instance from another data source</td>
</tr>
<tr>
<td>DNS Domain</td>
<td>Name of the DNS domain to which the instance belongs</td>
</tr>
<tr>
<td>Description</td>
<td>Fit (how deployed) and function (purpose) of the instance</td>
</tr>
<tr>
<td>Discovery source</td>
<td>Name of primary (most trusted) discovery source</td>
</tr>
<tr>
<td>Fault Count</td>
<td>Number of faulty recorded against the instance to date</td>
</tr>
<tr>
<td>First Discovered</td>
<td>Date and time instance was initially discovered</td>
</tr>
<tr>
<td>Fully Qualified Domain Name</td>
<td>Full path name of domain to which the instance belongs</td>
</tr>
<tr>
<td>IP Address</td>
<td>Primary IP address used by the instance</td>
</tr>
<tr>
<td>MAC Address</td>
<td>MAC address of the instance</td>
</tr>
<tr>
<td>Maintenance Schedule</td>
<td>Reference field to the Schedule table</td>
</tr>
<tr>
<td>Model Number</td>
<td>Manufacturer original model number</td>
</tr>
<tr>
<td>Monitor</td>
<td>Indicates whether the instance is monitored</td>
</tr>
<tr>
<td>Most Recent Discovery</td>
<td>Date and time instance was last discovered</td>
</tr>
<tr>
<td>Operational Status</td>
<td>Configurable choice list for current operational states</td>
</tr>
<tr>
<td>Schedule</td>
<td>Reference field to the Schedule table (for normal processing)</td>
</tr>
<tr>
<td>Start Date</td>
<td>Date and time the instance was last started</td>
</tr>
<tr>
<td>Subcategory</td>
<td>Name of Subcategory applicable to the instance</td>
</tr>
</tbody>
</table>

**CMDB record types**

The CMDB contains the following major record types.

**Table 19: CMDB record types**

<table>
<thead>
<tr>
<th>Record types</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration Item (CI)</td>
<td>Any computer, device, or service in the CMDB. A CI's record includes all of the relevant data, such as manufacturer, vendor, location, etc. Configuration items can be created or maintained either using tables, lists, and forms within the platform, or using the Discovery application.</td>
</tr>
</tbody>
</table>
### Record types

<table>
<thead>
<tr>
<th>Record types</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relation Type</td>
<td>A defined relationship between a CI and either another CI, a user, or a group. Relation types are defined twice, once from the perspective of the child CI and once from the parent CI’s perspective. For example, a parent CI that powers a child CI uses relation type Powers::Is Powered By. Example relation types include In Rack::Rack contains, Log Reviewed by::Reviews logs for, or Backup done by::Does backups for. CMDB relationships can be established using Discovery or using the tables, lists, and forms within the platform. The CMDB form has a specific Related Items toolbar optimized for modifying relationships.</td>
</tr>
</tbody>
</table>

---

**Related Lists of CI components**

Related Lists in CI records display additional components contained by that CI, such as disk drives on a server and the rules that control the behavior of a network router.

When Discovery runs, the Related List is populated with the components that Discovery finds running on the CI. The CI record might show different lists from scan to scan, depending on whether or not Discovery found the component.

By default, the Related Lists only display those components that are associated with that CI in the CMDB that have been discovered by the last scan. Components that are recorded in the CMDB but are not discovered in a scan, are deemed absent and do not appear in the list.

There are two types of components that appear in the Related List: those that are CIs themselves (such as hard disks), and those that are not (serial numbers and rules). The default filter condition in the breadcrumbs for components that are CIs is [Status] != [Absent]. The filter condition for components that are not CIs is [Absent] = [false].

In the following example, the snc-tc01 router has several Related Lists affected by these filter conditions, including routing rules, disk drives, interfaces, and network adapters. Only those components found during the last Discovery appear in these Related Lists.
Create a CI class

Create a CI class (table) that is an extension of an existing CI class. Then create identification and reconciliation rules for the new class.

The class that is being extended must have its Is_Extendable field checked, indicating that the class is extendable.

Roles:
- Itil_admin and personalize_dictionary: Required for editing the dictionary table
- admin: Full access

The CI Class Manager is a centralized location for managing CMDB tables and for creating a class that is derived from another CMDB class. Creating a class requires basic details such as a label and a name. Identification and reconciliation rules are also required to ensure that the class can be successfully identified by the identification engine.

For more information about extending a class and how attributes are derived from a parent class in that process, see Table extension and classes.

1. Navigate to Configuration CI Class Manager.
2. Click Hierarchy to expand the CI Classes list. Then select the class that the new class is extended from.
3. Click Add Child Class.
   The Add Child Class option appears only if the selected class is extendable.
4. On the Provide Basic Info tab, fill out the information and then click Next.

Figure 11: CI Related Lists

<table>
<thead>
<tr>
<th>Dest IP network</th>
<th>Type</th>
<th>Router Int</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.10.24.0/16</td>
<td>Direct</td>
<td>bridge0</td>
</tr>
<tr>
<td>10.10.10.31/32</td>
<td>Direct</td>
<td>lo0</td>
</tr>
<tr>
<td>127.0.0.1/32</td>
<td>Direct</td>
<td>lo0</td>
</tr>
<tr>
<td>10.10.10.23/24</td>
<td>Direct</td>
<td>bridge0</td>
</tr>
<tr>
<td>10.10.10.33/24</td>
<td>Direct</td>
<td>bridge0</td>
</tr>
<tr>
<td>10.10.11.42/32</td>
<td>Direct</td>
<td>bridge0</td>
</tr>
<tr>
<td>10.10.11.255/32</td>
<td>Direct</td>
<td>bridge0</td>
</tr>
<tr>
<td>10.10.10.30/32</td>
<td>Direct</td>
<td>bridge0</td>
</tr>
<tr>
<td>10.10.10.91/32</td>
<td>Direct</td>
<td>bridge0</td>
</tr>
<tr>
<td>10.10.10.6/32</td>
<td>Direct</td>
<td>bridge0</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>Display name</td>
<td>A unique label for the class (such as Laptops or Thin Clients). The label appears on list and form views for the class. Updating the Label field also updates the label record in the language file for the current language. See Field Labels in Data dictionary tables. Maximum string length is 80 characters.</td>
<td></td>
</tr>
</tbody>
</table>
| Table name   | Automatically populated based on the table label and a prefix as follows:  
  - For a table in a scoped application, the name is prefixed with a namespace identifier to indicate that it is part of an application.  
  - For a table in the global application, the name is prefixed with the string 'u_cmdb_ci'. You cannot modify the prefix; however, you can modify the rest of the table name. The name can contain only lowercase, alphanumeric ASCII characters and underscores (_). Maximum string length is 80 characters. |
| Description  | Explanation of the use purpose of the class. |
| Icon         | The icon associated with the class. |
| Extensible   | Indicator of whether this class can be extended. |

5. On the Add Attributes tab, click the + sign and enter details for each new class column. Then click Next. For description of the different columns in the list view, see Dictionary entry form. Set Identification to true to designate the column as a CI identifier for class identification.

6. On the Set Identification Rule tab, examine the Derived identification rule and its Identifier Entries. You can click Replace to replace the derived rule with a new identification rule and new identifier entries specific to the new class.

   See Identification rules for details about identification rules and identifier entries.

7. On the Dependencies tab, click Add dependency to add dependent rules. The Dependencies tab appears only if there are dependent identification rules for the selected class.

8. On the Add Reconciliation Rules tab, click Add to create the following rules:
   a) Reconciliation Rules
   b) Data Precedence Rules
   c) Data Refresh Rules

9. On the Add Suggested Relationships tab, review the diagram of the class derived suggested relationships. Use the filter to display only inbound, outbound, or specific relationship types. To add a suggested relationship for the class:
Reclassify a CI

You can upgrade, downgrade, or switch the class of a CI by modifying its Class attribute.

Role required: itil_admin (on top of itil), or admin

Each class is defined with a unique set of attributes. This set consists of attributes that were derived from the parent class, and additional attributes defined for the class.

When you reclassify a class, the following occurs.

1. The set of attributes is adjusted to match the set of attributes of the newly assigned class. Attributes are added or removed as needed.
2. If any attributes are unique to the current class and are not defined in the newly reclassified class, they are lost.
3. A new record with the CI's sys_id is inserted to the table of the new class, with the appropriate set of attributes for the class.

Depending on the reclassification, the following occurs.

**Downgrade**

The CI class is updated to a class that is lower in class hierarchy, and the newly assigned class is a parent of the current class. For example, reclassifying a CI from the cmdb_ci_server class to the cmdb_ci_computer class.

For example, the cmdb_ci_server class has attributes that the cmdb_ci_computer class does not have. During the downgrade, these attributes and their respective values are not included in the new CI record that is inserted into the cmdb_ci_computer class.

**Upgrade**

The CI class is updated to a class that is higher in class hierarchy, and the newly assigned class is a derived child of the current class and has additional attributes. For example, reclassifying a CI from the cmdb_ci_computer class to the cmdb_ci_server.

**Switch**

The newly assigned class is in a different branch in the class hierarchy and has a different set of attributes than the current class. For example, reclassifying a CI from the cmdb_ci_linux_server class to the cmdb_ci_win_server class.
A switch is a combination of a downgrade and an upgrade. For example if the CI is downgraded to the cmdb_ci_server, and then upgraded to the cmdb_ci_win_server class. Therefore, attributes are lost in the same manner as in a downgrade operation.

**Note:** Avoid the CI class downgrade and CI class switch operations as those can lead to data loss. When automatic CI reclassification is enabled (which is by default), the identification process can result in some automatic reclassifications which lead to data loss.

For more information about system properties that control system-wide behavior of automatic CI reclassification, see [CI reclassification](#) on page 125.

1. Locate the CI that you want to reclassify and display it in a list view.
   - You can use the application navigator. Or for example, if the CI is a server, then in the navigation search box, type cmdb_ci_server.list to display the CI in the Servers view.
2. Ensure that the Class field is displayed in the list.
   - If you do not see this attribute, personalize the list to add the Class field.
3. Double-click the Class value for the CI, and select a new class.
4. Click the green check box to confirm your selection.

**Delete all records for a CMDB class**

You can delete all the records for a CMDB class in the CI Class Manager.

Role required: itil_admin

1. Navigate to Configuration CI Class Manager.
2. Click Hierarchy to expand the CI Classes list and then select the class for which you want to delete all records.
3. In the class navigation bar on the left, click CI List.
4. On the CI List form view, scroll to the bottom and select the check box on the left side of Actions on selected rows.
   - This step selects all records of the selected class.
5. Click Actions on selected rows and select Delete.
6. Click Delete in the Confirmation dialog box.

**View and edit class definitions and metadata**

Use the CI Class Manager as a central location to explore the CMDB class hierarchy, CI table definitions, and class CIs. View the details of each table such as its label and fields, relationships, and all related metadata definitions.

The CI Class Manager displays the entire CMDB class hierarchy in a tree-view format, consolidating class definitions into a central location. It lets you display metadata information for a class, such as reconciliation rules, mandatory and recommended fields, and audit templates. You can also select a specific class to view, to modify, or to extend its definition to create a derived class. For each table, you can directly access CMDB Health settings and rules such as datasource precedence rules, orphan scorecard, and certificate template defined for the table class.
For more information about extending a class and how attributes are derived from a parent class in that process, see *Table extension and classes*.

1. Navigate to  **Configuration CI Class Manager**.
2. Click **Hierarchy** to expand the CI Classes list and then select a class to display details for.
3. On the class navigation bar, expand the following items to display further details for the class.
   - **Class Info**:
     - **Basic Info**: Displays details for the selected class, such as the display and table name, description, and class icon. Lets you edit some of the class definitions, and prevents editing of some details such as the table name.
       Role required: itil for reading, and itil_admin and personalize_dictionary for writing.
     - **Attributes**: Displays table attributes (columns). Lets you edit those attributes and add new ones. For description of the different attributes in the list view, see *Dictionary entry form*.
       Role required: itil_admin and personalize_dictionary for writing, and personalize_dictionary for reading.
       To add an attribute:
       1. Click the Added tab and scroll to the bottom of the list.
       2. Double-click **Insert new column**, and enter details for each new class attribute. Set **Identification** to true to designate an attribute as a CI identifier for class identification.
       3. Click **Save**, and fix any errors that appear.
   - **Identification and Reconciliation**: Displays and lets you edit, create, and delete identification and inclusion rules, reconciliation, data precedence, and data refresh rules for the class.
     See *CMDB Identification and Reconciliation* on page 105 for more information.
     Role required: itil for reading, and itil_admin (on top of itil) for writing.
   - **Dependent Relationships**: Displays and lets you edit, create, and delete hosting and containment relationships for the class. See *CMDB dependent relationship rules* on page 126 for more information.
     Role required: itil for reading and itil_admin (on top of itil) for writing.
   - **Suggested Relationships**: Displays a diagram of all suggested relationships for the class, and lets you delete or add suggested relationships for the class. Use the navigation tools to increase or decrease the diagram, and to move the diagram on the page. Use the filter to display specific relationship types. See *Suggested class relationships* on page 53 for more information.
     Role required: itil
   - **All Relationship Rules**: Displays a combined diagram of all suggested relationships and all dependent relationships for the class. Use the navigation tools to zoom in or out, and to move or center the diagram on the page. Use the filter to display specific relationship categories.
   - **Health**: Lets you review and configure CMDB Health-related system properties, scorecards, and rules and settings for all CMDB health KPI and metrics, at the class level. See *CMDB Health* on page 148 for information about enabling and configuring CMDB Health, and displaying health reports.
     Role required: Itil for reading and itil_admin (on top of itil) for writing.
   - **CI List**: Displays the CIs of the selected class. Lets you create CIs of the selected class and perform other operations such as delete.
     Role required: Itil for reading. Writing requirements follow the selected table settings.

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Querying the CMDB

The CMDB Query Builder allows you to easily build complex infrastructure and service queries that span multiple CMDB classes, and that involve many CIs that are connected by different relationships.

The CMDB Query Builder provides a canvas into which you drag the CI classes and other artifacts that you want to include in a query. Then you add relationships, AND/OR operators between the CI classes, and define the relationship properties to query for. You can use saved queries to populate a CMDB group with CIs, and then use scriptable APIs to retrieve the CI list and apply actions collectively to all the CIs in the group.

There are two query types: CMDB Query and a Service Mapping query, which you can use separately or in combination to create queries such as:

- All CIs of a certain type in a business service. For example, all Apaches/Web Servers/Linux servers per service.
- All virtual servers and the physical servers that host them.
- All servers that are not mapped to any business service.
- All Servers with a database.
- All database servers that are included in any business service or in a particular business service.
- All business services and their associated servers and the cost of each server. This query helps evaluate the cost of technology for each business service

The Query Builder uses the concept of start node which is the starting point of the query and is noted by gray background in its query node. The first class that you drag to the canvas becomes automatically the start node of the query and you cannot select a different start node. In a complex query, the start node must always be the only node connected to an AND/OR operator. If you try to connect a second node to an operator that the start node is connected to, the query fails to run and you will be prompted to select a different start node.

CMDB Query

A query type that queries the infrastructure for CI classes, and the relationships and references that connect them.

Service Mapping Query

A query type that queries business services and technical services, and thus requires that Service Mapping is activated. The query is framed within a business service map. You define a pattern, and query for business service maps that have that pattern in their definition. The relationships in Service Mapping queries are matched by single-level direct relationships which is similar to the CMDB queries, and in addition, they are also matched by multi-level indirect relationships if they exist. A query for a relationship between two CI classes is satisfied even if the two CI classes are connected by intermediate CI classes that are not specified in the query.

Combination Query

You can combine the two query types by incorporating a saved Service Mapping query into a CMDB query. For example, create a CMDB query for Windows Servers that are connected to Tomcat WAR. Then connect the Tomcat WAR CI class to a Service Mapping query. This changes the query to find Windows Servers that are connected to Tomcat WAR which is included in the services that returned by the Service Mapping query. You can inverse that query by choosing - Does Not Belong To Service. This changes the
query to find Windows Servers that are connected to Tomcat WAR that is not included in services returned by the Service Mapping query.

**Relationship properties**

When you connect CI classes on the canvas, the CMDB Query Builder displays the Connection Properties dialog box where you can choose from a list of relationships that exist between these two CI classes including relationships to descendent classes. For Service Mapping queries, only related and not-related connections are displayed.

The relationship arrow on the canvas shows the direction of the query, but the connection properties for the relationship determine what the relationship is queried for.

Connection properties include:

- **Parent/child direction**: Which CI class is the parent and which CI class is the child in the relationship.
- **No relations**: Query for a CI class which has no relation to the class it is connected to.
- **References fields**: A field that the parent and ancestor parent CI classes use to reference the child CI class.

Newly added relationships between CI classes may take up to 30 minutes to appear in the relationship list.

**Domain separation in CMDB Query Builder**

This is an overview of domain separation as it pertains to the CMDB Query Builder. Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.

**Overview**

Domain separation is supported in this application. Not all ServiceNow applications support domain separation; some include limitations on the data and administrative settings that can be domain separated. To learn more, see **Application support for domain separation**.

**How domain separation works in the CMDB Query Builder**

With the CMDB Query Builder you can easily build complex infrastructure and service queries that span multiple CMDB classes, and that involve many CIs that are connected by different relationships. Domain separation is set to be on by default.

- **Saved Query**
  
  The user creates a query by dragging a class node from the class hierarchy and dropping it to the canvas and connecting the nodes with the relationships type.

  The user can save the created query as an XML file to the database [qb_saved_query] table in the CMDB for future use. The saved query is domain separated.

- **Query results**
  
  With a saved query, the user clicks Run and the query result is saved and displays in the platform list view.

  In the query results, the domain separation behaves in the same way as the platform list view for the CI relationship [cmdb_rel_ci] table and CMDB CI [cmdb] table. Consequently, since the CI relationship is not domain separated, all relationships of the query result display, regardless of the domains.
Conversely, if the query result is CI only, since the CMDB CI is domain separated, the results display only if visible in the current domain.

Build a CMDB query using the CMDB Query Builder

Build a CMDB query in the CMDB Query Builder.

The UI16 plugin (com.glide.ui.ui16) must be activated.

Role required: cmdb_query_builder (contained for itil and asset)

Build the query by dragging the CI classes that you want to include in the query, dropping them as nodes on the canvas, and then defining relationship properties between them. For every class node in the query, you can filter on its attributes to narrow down the results to a specific set of CIs of that class or to a single specific CI. You can also select the property columns that display in the query results. Query filters use related list conditions which allow the inclusion of a relationship with another table in the filter. For more information, see Add related list conditions.

Authorized users can update and delete a query created by another user.

1. Navigate to Configuration and click CMDB Query Builder.
2. On the CMDB Query Builder page you can:
   a) Click Create new. Type in a Name, choose CMDB Query as the Query type, and click Create.
   b) Click a widget of a saved query to continue building an existing query. Search saved queries on page 91 first if needed.
   c) Point to the upper right corner of a saved query widget, and click the Duplicate Query icon to edit a copy of a saved query. The new query’s default name contains the string ‘copy’.
3. On the canvas, you can:
   • Add CI classes to the query: Select classes from the class hierarchy under CMDB Artifacts and drag them to the canvas.
   • Add connections between two nodes on the canvas:
     1. On the first node in the relationship, click the small square at the center of the right side to toggle its color to blue.
     2. On the second node in the relationship, click the small square at the center of the left side to toggle its color to blue.
   3. In the Connection Properties dialog box:
      • Choose the parent/child roles in the relationship and then configure the properties in the respective section of the connection properties.
      • Click Add Relations and select a relationship from the list of existing relationships between the CIs (including descendant classes).
      • Select No Relations to query for classes that do not have any relationships with each other. For example, query for all Tomcat WAR CIs which are not connected to a Windows Server.
      • Click Add Reference to choose a field that the parent class (including ascendant parent classes) uses to reference the child.
4. Click Confirm.
Table 20: Relationship UI Notations

<table>
<thead>
<tr>
<th>Notation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full line</td>
<td>A relationship in a CMDB query.</td>
</tr>
<tr>
<td>Dotted line</td>
<td>A relationship in a Service Mapping query.</td>
</tr>
<tr>
<td>Red asterisk at the center of the connection line</td>
<td>Information such as relationship type is missing, invalidating the query.</td>
</tr>
</tbody>
</table>

- **Add filters to the query:**

  The initial elements of a query are classes. Applying filters, you can narrow a class down to a specific set of CIs or to a single specific CI.
  1. Point to the node to add a filter to.
  2. Click the Apply Filters icon that pops up above the node.
  3. Add attribute and related list conditions.
  4. Close the Filters section on the canvas.

For example, add a filter for database location to query for databases located in Seattle.

Click Applied Filters in the navigation bar on the right to view all filters that were added for each node on the canvas. When you select a set of filters in the navigation bar, the respective node that these filters apply to, is highlighted. And, if you select a node, the respective set of filters that apply to that node, is highlighted.

- **Add AND/OR operations to the query:**

  1. Connect one node to two other nodes.
  2. Click the AND box that appears to toggle between the And and the Or operations.

For example, C1 is Tomcat WAR, C2 is Linux Server, and C3 is Windows Server. Query for all Tomcat WAR CIs which are connected either to Linux Server Or to a Windows Server.

- **Add property columns to display in the query results:**

  Note: For a relationship, the query results display the parent, child, and type columns. You cannot add any other columns from the [cmdb_rel_ci] table.
  1. Click the node to add properties to.
  2. Click the Properties tab, and then click Add Columns.
  3. Select the properties to display and then click outside the properties list to close it.

- **Select columns and add filters that will be applied to the resulting set of services:**

  1. Ensure that Properties is selected at the top on the right-hand side navigation bar, and then click an empty space on the canvas to ensure that nothing is selected.
  2. Click Add Columns at the bottom of the right-hand side navigation bar and select columns to add.

- **Create a combination query by integrating a Service Mapping query into a CMDB query:**

  1. Click Saved Service Queries.
2. Select a Service Mapping query and drag it to the canvas.

This query returns all CIs that satisfy the CMDB query, and that are included in the services returned by the Service Mapping query.

- Add a search tag that can then be used as a search criteria for saved queries:
  1. Click the Add Tags icon.
  2. Click Add Tag, and enter the tag string.
  3. Click the Add Tags icon again to close the Query Tags dialog box.

4. Modify the query:
   - Apply filters: Click a node and then click the Apply filters icon to add or edit the node's filters.
   - Modify relationship properties: Click the line that represents the relationship between two nodes to display the Connection Properties on the right-hand side pane.
   - Modify Query Builder settings: Click the (Settings) icon to open the Query Builder Settings dialog box.

   • Click Save.

In the Saved Queries tab, you can point to a saved query widget and click the 'i' icon to view query information such as the query type, last update date, CMDB groups associated with the query, and the query schedules.

- Click Run.

**Note:** When a query is running, wait for it to complete or to time out before opening or running another query.

The query results pane displays only the first 200 results of the query.

- Click Load More Results to display the next set of 200 results.
- Click Load All Results to display up to 10000 results. You can use the glide.cmdb.query.max_results_limit system property to configure this number.
- Click a CI to open its CI form, and on the CI form you can click Dashboard to view CI health in the CI dashboard.

- *Create a report from CMDB query results* on page 90.
- *Create a schedule* to run the query at a future time, and to email the results to interested parties.
- Click the Query Results context menu and select Export. The number of results that are exported is determined by the glide.cmdb.query.max_results_limit property, which by default is set to 10000.

The exported file contains the query results with the addition of the CIs and relationship sys_ids.

- *Populate a CMDB group* using the saved query.

### Build a Service Mapping query using the CMDB Query Builder

Build a Service Mapping query in the CMDB Query Builder. A Service Mapping query is a pattern consisting of classes and relationships between those classes. After you build the pattern and run the query, the query returns all the Service Mapping services that contain that pattern.
Service Mapping and *Ui16* (com.glide.ui.ui16) must be activated.
Role required: cmdb_query_builder (contained for itil and asset)

Build the query by dragging the CI classes that you want to include in the query, dropping them as nodes on the canvas, and then defining relationship properties between them. For every class node in the query, you can filter on its attributes to narrow down the results to a specific set of CIs of that class or to a single specific CI, and you can select the property columns that display in the query results. Query filters use related list conditions which allow the inclusion of a relationship with another table in the filter. For more information, see *Add related list conditions*.

Authorized users have the ability to update and delete a query that was created by another user.

1. Navigate to Configuration and click CMDB Query Builder.
2. On the CMDB Query Builder page do either of the following:
   a) Click Create new. Type in a Name, choose Service Mapping Query as the Query type, and click Create.
   b) Click on a widget of a saved query to continue building an existing query. *Search saved queries* on page 91 first if needed.
   c) Point to the upper right corner of a saved query widget, and click the Duplicate Query icon to edit a copy of a saved query. The new query's default name contains the string 'copy'.
3. Do any of the followings on the canvas:
   • Add CI classes to the query: Select classes from the class hierarchy under CMDB Artifacts and drag them to the canvas.
   • Add connections between two nodes on the canvas:
     1. On the first node in the relationship, click the small square at the center of the right side to toggle its color to blue.
     2. On the second node in the relationship, click the small square at the center of the left side to toggle its color to blue.
   3. In the Connection Properties dialog box:
     • Choose the parent/child roles in the relationship and then configure the properties in the respective section of the connection properties.
     • Click Add Relations and select a relationship from the list of existing relationships between the CIs (including descendant classes).
     • Select No Relations to query for a pattern in which the two classes have no relationships with each other. For example, all Tomcat WAR CIs which are not connected to a Windows Server.
     • Click Add Reference to choose a field that the parent class (including ascendant parent classes) uses to reference the child.
4. Click Confirm.

### Table 21: Relationship UI Notations

<table>
<thead>
<tr>
<th>Notation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dotted line</td>
<td>A relationship in a Service Mapping query.</td>
</tr>
<tr>
<td>Red asterisk at the center of the connection line</td>
<td>Information such as relationship type is missing, invalidating the query.</td>
</tr>
</tbody>
</table>
• Add filters to the query:

The initial elements of a query are classes. Applying filters, you can narrow a class down to a specific set of CIs or to a single specific CI.

1. Point to the node to add a filter to.
2. Click the Apply Filters icon that pops up above the node.
3. Add attribute and related list conditions.
4. Close the Filters section on the canvas.

For example add a filter for business criticality to query for businesses that are 'most critical'.

Click Applied Filters in the navigation bar on the right to view all filters that were added for each node on the canvas. When you select a set of filters in the navigation bar, the respective node that these filters apply to, is highlighted. And, if you select a node, the respective set of filters that apply to that node, is highlighted.

• Add AND/OR operations to the query:

1. Connect one node to two other nodes.
2. Click the AND box that appears to toggle between the And and the Or operations.

For example C1 is Tomcat WAR, C2 is Linux Server, and C3 is Windows Server. Query for all Tomcat WAR CIs which are connected either to Linux Server Or to a Windows Server.

• Add property columns to display in the query results:

  Note: For a relationship, the query results display the parent, child, and type columns. You cannot add any other columns from the [cmdb_rel_ci] table.

1. Click the node to add properties to.
2. Click the Properties tab, and then click Add Columns.
3. Select the properties to display and then click outside the properties list to close it.

• Select columns and add filters that will be applied to the resulting set of services:

1. Ensure that Properties is selected at the top on the right hand-side navigation bar, and then click an empty space on the canvas to ensure that nothing is selected.
2. Click Add Columns at the bottom of the right hand-side navigation bar and select columns to add.
3. Click the Apply Service Mapping Query Filters icon at the top of the canvas and add filters.

• Disable Services Including This Pattern to inverse the entire query and search for all Service Mapping services that do not include the query pattern.

• Add a search tag that can then be used as a search criteria for saved queries:

1. Click the Add Tags icon.
2. Click Add Tag, and enter the tag string.
3. Click the Add Tags icon again to close the Query Tags dialog box.

4. Modify the query:

• Apply filters: Click a node and then click the Apply filters icon to add or edit the node's filters.
• Modify relationship properties: Click the line that represents the relationship between two nodes to display the Connection Properties on the right hand side pane.
• Modify Query Builder settings: Click the (Settings) icon to open the Query Builder Settings dialog box.

• Click Save. A saved Service Mapping query can be built into a CMDB query.
In the Saved Queries tab, you can hover over a saved query widget and click the ‘i’ icon to view query information such as the query type, last update date, CMDB groups associated with the query, and the query schedules.
• Click Run.

  **Note:** When a query is running, wait for it to complete or to timeout before opening or running another query.

The query results pane displays only the first 200 results of the query.
• Click Load More Results to display the next set of 200 results.
• Click Load All Results to display up to 10000 results. You can use the glide.cmdb.query.max_results_limit system property to configure this number.
• Click a CI to open its CI form, and on the CI form you can click Dashboard to view CI health in the CI dashboard.

• Create a report from CMDB query results on page 90.
• Create a schedule to run the query at a future time, and to email the results to interested parties.
• Click the Query Results context menu and select Export. The number of results that are exported is determined by the glide.cmdb.query.max_results_limit property, which by default is set to 10000.

The exported file contains the query results with the addition of the CIs and relationship sys_ids.
• Populate a CMDB group using the saved query.

**Sample CMDB queries**

Use the following sample queries to build your own CMDB queries.

Using the CMDB Query Builder requires that the *UI16 plugin* (com.glide.ui.ui16) is activated.

**CMDB query sample**

Use this example to build a CMDB query.

**All servers with a connection to a database**

1. Navigate to Configuration and click CMDB Query Builder
2. Click Create new. Enter a Name - All servers with a connection to a DB. Choose CMDB Query, and click Create.
3. In the CMDB Artifacts list, locate the Server class, and drag it to the canvas.
4. Locate the Database class, and place it to the right of the Server class node on the canvas.
5. Click at the center of the right side of Server, and then at the center of the left side of Database to create a connection.
6. In the Connection Properties dialog, in the Add Relations for Server 1 section – one by one, select all the listed relationships.

   Note that the added relationships are displayed in the navigation bar on the right, underneath Server 1.

7. Click Save, and then click Saved Queries on the left to see the tile for the saved query.

8. Click the query tile to return to the canvas in edit mode.

9. Click Run to execute the query.

   Review the query results. Each row displays the name of a server CI, the name of a database CI, and the relationship type between them.

10. Add columns to the query results:
   a. Click Server 1 on the canvas.
   b. On the right navigation bar, underneath Server 1 Report Columns, click Add Columns.
   c. Select Manufacturer.
   d. Click Run.

      Review the query results which now include the Manufacturer column.
   e. Click Save again to save all your customization for this query.

Service Mapping query sample
Use this example to build a Service Mapping query.

**Linux server in services**

   **Note:** To build and run a Service Mapping query, Service Mapping must be activated.

1. Navigate to Configuration and click CMDB Query Builder
2. Click Create new. Enter a Name - Linux server in services. Choose Service Mapping Query, and click Create.
3. In the CMDB Artifacts, locate Linux Server, and drag it to the canvas.
4. Click Run.

      Review the query results. Each row displays the name of a Service Mapping Service and the name of a Linux Server that is a member of that service.
5. On the right navigation bar, click Disable Service Including This Pattern, and then click Run again.

      Review the query results. Now, each row displays the name a Service Mapping Service that does not include the specified Linux Server.
Run a partial CMDB query

You can run a partial query in the CMDB Query Builder by defining a section of a query, and then running it.

The **UI16 plugin** (com.glide.ui.ui16) must be activated.

Role required: cmdb_query_builder (contained for itil and asset)

While building a query or reviewing a saved query, you can run only a section of the query. On the canvas in the CMDB Query Builder, highlight a section of the query which contains the nodes and relationships of the partial query that you want to run. You can then examine the results of the partial query, and update the query if needed.

1. Navigate to Configuration and click CMDB Query Builder.
2. On the CMDB Query Builder page, click a tile to open an existing query.
3. Click the selection tool under the **navigation tool** to switch to a section selection mode.
4. Border a section of the query:
   a) Click the mouse device on the upper left corner of the section that you want to create.
   b) Drag the mouse device to the bottom right corner of the section that you want to create. As you drag the mouse device, the selected section is highlight in light blue.
   c) Release the mouse device. The query nodes that are included in the partial query, appear with a blue border.
5. Click Run.
6. In the Pick Starting Node dialog box, select the starting node for the partial query, and click Confirm.

The results of the partial query appear in the Results pane.

Create a report from CMDB query results

After running a query in the CMDB Query Builder, you can generate reports that are scoped to the query results.

The **UI16 plugin** (com.glide.ui.ui16) must be activated.

Role required: cmdb_query_builder (contained for itil and asset)

1. Navigate to Configuration and click CMDB Query Builder.
2. Build a query.
3. In the query results pane, click the list context menu and select Bar Chart or Pie Chart.

The Reports application creates a report that is scoped to the query results.

Settings in CMDB Query Builder

Use settings to control some aspects of the CMDB Query Builder behavior.

Using the Query Builder requires that the **UI16 plugin** (com.glide.ui.ui16) is activated.

Open the Query Builder Settings dialog box:

1. Navigate to Configuration and click CMDB Query Builder.
2. On the CMDB Query Builder page, click the (Settings) icon.

3. Click the Settings icon again to close the dialog box.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Relationships in Results</td>
<td>Enable to display the relationship between CIs in the query results.</td>
</tr>
<tr>
<td>Display Suggested Connections</td>
<td>Enable to filter the class hierarchy in the left pane to display only classes that the selected class on the canvas has a relationship with. You can then drag any class from the filtered list to the canvas, and connect it to the selected class on the canvas. This setting applies only to CMDB queries.</td>
</tr>
</tbody>
</table>

**Navigation in CMDB Query Builder**

Use the navigation tools to enlarge or shrink the query, to move the query, or to border a section of the query to run.

Using the Query Builder requires that the **UI16 plugin** (com.glide.ui.ui16) is activated.

Use the buttons in the navigation tool as follows:

- Use the plus sign (+) to increase magnification of the query.
- Use the minus sign (-) to decrease magnification of the query.
- Click the center dot to center the query on the canvas.
- Use the direction arrows to move the query in that direction.
- Use the selection tool under the navigation tool to toggle between two states:
  - Moving the entire query on the canvas.
  - Bordering a section of the query, which you can then run as a partial query.

**Search saved queries**

The CMDB Query Builder allows you to search for a specific saved query using any combination of search criteria based on the query’s title, type, custom tags, and who created or updated the query.
To locate a saved query using a Query Tags search criteria, the query must have a query tag associated with it. For more information see *Build a CMDB query using the CMDB Query Builder* on page 83, or *Build a Service Mapping query using the CMDB Query Builder* on page 85.

The **UI16 plugin** (com.glide.ui.ui16) must be activated.

Role required: cmdb_query_builder (contained for itil and asset)

1. Navigate to Configuration CMDB Query Builder.
2. In the Search Saved Queries box on the Saved Queries tab, enter a string to search for. The resulting list displays all search categories that can be applied using the search string.
3. Select an item from the list to add it as a search criteria.
4. Refine the search string or select additional search criteria as needed.

### Create a schedule for a CMDB query

Schedule a CMDB query to run once at a scheduled time or on a recurring schedule, and to email the query results to specified users.

The **UI16 plugin** (com.glide.ui.ui16) must be activated and a saved CMDB query that was built in the CMDB Query Builder must exist.

Role required: cmdb_query_builder (contained for itil and asset)

The query results are attached to the email as a file in the specified format. By default, the maximum result rows that can be attached is 10,000. This is controlled by a system property.

1. If need to, navigate to Configuration, click CMDB Query Builder, and then click a saved query.
2. Click Create Schedule and fill out the form.

**Table 22: Scheduled Email of Query Builder form**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Query</td>
<td>The query to run.</td>
</tr>
<tr>
<td>Users</td>
<td>Users who should receive query results email.</td>
</tr>
<tr>
<td></td>
<td>To receive emails, users must have an Email address defined and have Notifications set to Enable in their user records.</td>
</tr>
<tr>
<td>Groups</td>
<td>Groups to email the query results to.</td>
</tr>
<tr>
<td>Zip output</td>
<td>Indicates whether the report should be sent as a zip file.</td>
</tr>
<tr>
<td>Active</td>
<td>Indicates whether to run the query according to the specified schedule.</td>
</tr>
<tr>
<td>Run</td>
<td>Frequency for running the query.</td>
</tr>
<tr>
<td>Time</td>
<td>Time of day to run the query.</td>
</tr>
<tr>
<td>Conditional</td>
<td>Indicates whether to display the Condition field, which allows you to specify conditions under which the query runs.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Omit if not records</td>
<td>Indicate whether to distribute email if the query returns zero results.</td>
</tr>
<tr>
<td>Email addresses</td>
<td>Email addresses of users who should receive the email but who are not in the system.</td>
</tr>
<tr>
<td>Subject</td>
<td>Text that appears in the subject line of the distribution email.</td>
</tr>
<tr>
<td>Introductory message</td>
<td>Additional message that is delivered with the query results.</td>
</tr>
<tr>
<td>Condition</td>
<td>User-created script that checks for certain conditions to be true before running the query. This field is visible only when Conditional is checked.</td>
</tr>
<tr>
<td>Type</td>
<td>File format to use for the query results.</td>
</tr>
</tbody>
</table>

**Note:** Configure the form layout to add this field to the form.

**System properties associated with the CMDB Query Builder**

CMDB Query Builder uses the following system properties.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
</table>
| glide.cmdb.query.max_results_limit           | Limit of the number of results in a scheduled query, exported query, and in a call to the queryAll API.  
- Type: Numeric  
- Default value: 10,000  
- Location: System Property [sys_properties] table. |
| glide.cmdb.query.batch_time_limit_in_sec     | Time limit (in seconds) for running one batch to get one batch of query results (200 results).  
- Type: Numeric  
- Default value: 300  
- Location: System Property [sys_properties] table. |
<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.cmdb.query.query_time_limit_in_sec</td>
<td>Time limit (in seconds) for running an entire query to get all results.</td>
</tr>
<tr>
<td></td>
<td>• Type: Numeric</td>
</tr>
<tr>
<td></td>
<td>• Default value: 1800</td>
</tr>
<tr>
<td></td>
<td>• Location: System Property [sys_properties] table.</td>
</tr>
</tbody>
</table>

**CMDB CI Lifecycle Management**

From the time of its creation to the time that it is no longer needed, a CMDB CI would typically transition through several operational states while undergoing various operations. CI Lifecycle Management provides the mechanism to define states and actions for a CI and lets you apply appropriate actions based on a CI's state to tailor the management of CI lifecycle to business needs.

Terms associated with CI Lifecycle Management:

**Operational states**

A set of states that a CI can be at such as 'Operational' or 'Repair in Progress'. A CI can be associated with only a single operational state at any given time. The choices for operational states are based on the operational_status field in the [cmdb_ci] table. There are several operational states that are defined in the base system such as 'Retired' and 'Repair in Progress'. You can modify this list to reflect operational states that are relevant in your business.

**Note:** By default, Service Mapping is configured to ignore all host CIs for which the value of Operational status [operational_status] is not 1 (Operational) or the value of status [install_status] is 100 (absent). For additional information about this behavior, see *Preparing customized ServiceNow deployments to work with Service Mapping* [KB0647574] in the HI Knowledge Base.

CI Lifecycle Management allows multiple operators and automations to simultaneously set different operational states of a CI. Since a CI cannot be associated with multiple operational states, it is important to configure each operational state with a priority. These priorities are then used in such situation to determine which of the operational states is the cumulative operational state.

**CI actions**

A set of actions that can be applied to a CI during its lifetime. You can define CI actions that are relevant in your business.
Compatible CI Actions

CI Lifecycle Management allows a CI to have multiple active CI actions simultaneously, however they must be specifically defined as compatible. By default, there are no two actions for a CI that are compatible with each other. You can change this behavior by specifying pairs of actions that are compatible and thus allowed to be applied simultaneously to a CI. For example, you can specify that the ‘Patching’ and the ‘Provisioning’ CI actions are compatible making it possible to apply both simultaneously to a CI.

Not Allowed CI Actions

By default, any CI action can be applied to any CI. You can restrict this behavior by defining a rule that an action is not allowed for a CI when it is in a specific operational state. For example, you can define a Not Allowed CI Action in which it is not allowed to apply the ‘Provisioning’ action to a Linux Server that is in a ‘Non-Operational’ state.

Not Allowed Operational Transitions

By default, transitions are allowed from any operational state to another. You can restrict this behavior by defining a rule that for a specified CI, a transition from a certain operational state to another operational state is not allowed. For example, you can define that for a Linux Server it is not allowed to transition from ‘Repair in progress’ to ‘Non-Operational’.

Requestor

A requestor can be a workflow or a non-workflow operator that is trying to set operational states and apply CI actions. Each requestor has an associated requestor ID that is a GUID and that can be an active workflow context or a non-workflow registered operator ID.

Lease time

A time period that each requestor (especially non-workflow operators) can provide, during which a specified CI action is allowed to be active for a specified CI.

CMDB CI Lifecycle Management provides a set of APIs to manage CI operational states and CI actions. And the UI where you define a set of rules to restrict certain operational state transitions and to restrict actions based on operational states. It also provides a mechanism to audit CI operational state and CI actions during the entire CI lifecycle.

Providers such as automation, workflows, or Change Management can use CI Lifecycle Management as a mechanism to manage CI operational states and apply CI actions. By default, the behavior of CI Lifecycle Management has no restrictions on some operations, and full restrictions on other operations. The CI Lifecycle Management UI lets you modify this default behavior by specifying Not Allowed CI Actions, Compatible CI Actions, and Not Allowed Operational Transitions that restricts some operations and enables for others.

With CI Lifecycle Management you can:

- Manage CI operational states and CI actions throughout the entire CI lifecycle.
- Manage CI operational state transitions.
- Restrict certain operational state transitions.
- Associate certain actions for certain CI types that are in specific operational state.
• Restrict IT Service Management applications based on CI operational state.
• Audit CI operational states and CI actions during the entire CI lifecycle.

**Lifecycle management APIs**

CI Lifecycle Management provides a set of APIs to manage CI operational state and CI actions during the entire CI lifecycle. All restrictions and allowances specified by rules in the UI are enforced when state management APIs run, and if an API attempts to perform a restricted operation, the operation is blocked and an error is logged.

**Registering requestors**

When using the lifecycle management APIs to apply CI actions, requestors are required to be registered and to obtain a requestor ID which is unique within the lifecycle management tables. To register and to obtain a requestor ID, non-workflow users should call the registerOperator API. Workflow users can use the active Workflow context as the requestor ID, and they do not need to explicitly call registerOperator.

After completing the CI lifecycle operations, the requestor should call the unregisterOperator API to unregister. All the state management records associated with that specific requestor ID are then marked as inactive or they are removed by the CI Lifecycle Management — Restore Internal State Management Tables scheduled job.

**Integration with Incident Management and Problem Management**

A base instance includes the pre-defined CI action CreateTask used for creating a task for a CI. New instances have a pre-defined Not Allowed CI Action, specifying that the CreateTask action is not allowed for any CI with a Retired operational state. This restriction is integrated with Incident Management and with Problem Management to prevent the creation of incident or problem tasks for retired CIs. The CreateTask CI action is used as a reference qualifier to the Configuration Item field of the Incident/Problem tables. In a new incident or problem, CIs in which Operational Status is Retired — are filtered out from the Configuration Item list on the form. For more information about reference qualifiers, see *Reference qualifiers*.

**Integration with Asset Management**

In a base system, a CI's Operational Status field and the Status/Hardware Status (if its hardware) fields are kept synchronized if one of the two fields' values is Retired. When Operational Status of a CI is set to Retired, then the Status/Hardware Status field is automatically set to Retired. In the opposite direction, when the Status/Hardware Status field of a CI is set to Retired, Operational Status is then automatically set to Retired too. When an Operational Status field changes from Retired to another status, the CI's Status/Hardware Status field is set to Installed. And when a CI's Status/Hardware Status field changes from Retired to another status, the Operational Status field is automatically set to Non-Operational.

Whenever CI's Status/Hardware Status changes, it is synchronized to the CI's corresponding Asset State field, and vice versa — keeping the CI's Operational Status and the CI's corresponding Asset State synchronized.

For more information about mapping Asset State and Substate fields to a CI's Status/Hardware Status (if its hardware) field, see *Map asset state and CI hardware status*. And for more information about retiring assets, see *Retire assets*. 
Get started with CI Lifecycle Management

Follow these high level steps to get started and to track activities of the CI Lifecycle Management module of the CMDB application.

1. **Activate the base system** CI Lifecycle Management - Restore Internal State Management Tables scheduled job that continuously checks and maintains data integrity of all internal CI Lifecycle Management tables.

2. **Define CI actions.**

3. **Define compatible CI actions** rules.
   
   Navigate to Configuration CI Lifecycle Management CMDB CI Actions to display currently active/inactive CI actions in the CMDB.

4. **Define not-allowed CI actions** rules.

5. **Define not-allowed operational state transitions** rules.

6. Define new operational states by modifying the operational_status field in the [cmdb_ci] table in the system dictionary.
   
   Navigate to Configuration CI Lifecycle Management View Internal Operational States to display available operational states set by each requestor.

7. **Set priority for operational states.**

8. Call APIs to apply CI actions.

   Navigate to Configuration CI Lifecycle Management CMDB CI Actions to display which actions were submitted and their active/inactive state in the CMDB.

9. Navigate to Configuration CI Lifecycle Management View CI State Registered Users to display currently registered operators that were registered via the registerOperator API.

10. **Review Renew Lease tasks and extend leases as needed:** Navigate to Configuration CI Lifecycle Management Renew Lease Tasks. These tasks are created automatically by the CI Lifecycle Management - Restore Internal State Management Tables scheduled job for CI action records in which the lease for a valid requester has expired. The Requestor should use the lifecycle management API ExtendCIActionLease to extend the lease. Otherwise, if the lease remains expired for a specified grace period, the CI Lifecycle Management - Restore Internal State Management Tables scheduled job marks the respective CI action record as ‘inactive’.

    The grace period for expired lease time is configurable by the system property glide.cmdb.statemgmt.max_lease_expired_days.

11. Navigate to Configuration CI Lifecycle Management State Management Logs to display logs of CI Lifecycle Management operations.

**Lifecycle management APIs**

CI Lifecycle Management provides a set of state management APIs for manipulating CI operational states, and applying CI actions. State management APIs adhere to restrictions and allowances specified by Not Allowed CI Actions, Compatible CI Actions, and Not Allowed Operational Transitions. If an API attempts to perform a restricted operation, the operation is blocked, an error is logged, and a task is automatically created if appropriate.

Lifecycle management APIs can set operational states and CI actions to CMDB groups by utilizing lifecycle management bulk APIs.

**Registration APIs**

- registerOperator() - Method to register operator with state management for non-workflow user.
• unregisterOperator(String requestorId) - Method to unregister operator for non-workflow users.
• isValidRequestor(String requestorId) - Method to determine if the specified requestor is a valid active workflow user or a registered user.
• isLeaseExpired(String requestorId, String ciSysId, String ciActionName) - Method to check if registered user lease expired.
• extendCIActionLease(String requestorId, String ciSysId, String ciActionName, String leaseTime) - Method to extend CI Action Lease time, for registered users. If previous lease already expired, extend lease from now.

Operational State APIs

• setBulkCIOperationalState(String requestorId, String sysIdList, String opsLabel, String opsStateListOld) - Method to set Operational State for an array of CIs.
• getOperationalState(String ciSysId) - Method to get CI Operational State.

CI Actions APIs

• addBulkCIAction(String requestorId, String sysIdList, String ciActionName, String ciActionListOld, String leaseTime) - Method to add CI Action for an array of CIs.
• removeBulkCIAction(String requestorId, String sysIdList, String ciActionName) - Method to remove a CI Action for a list of CIs.
• getCIActions(String ciSysId) - Method to get CI Actions.

Not Allowed Action Based on Operational State API

• isNotAllowedAction (String ciType, String opsLabel, String actionName) - Method to check if a specific CI action is not allowed for specific Operational State on a CI Type.

Not Allowed Operational State Transition API

• isNotAllowedOpsTransition(String ciType, String opsLabel, String transitionOpsLabel) - Method to check if specific operational state transition is not allowed on a CI Type.

Compatible Action API

• isCompatibleCIAction(String actionName, String otherActionName)- Method to check if two specific actions are compatible with each other.

Using state management APIs

    // 1. Register Operator with State Mgmt
    var output = SNC.StateManagementScriptableApi.registerOperator();
    var jsonUntil = new JSON();
    var result = jsonUntil.decode(output);
    var requestorId = result.requestorId;

    // Get list of sys_ids to update
var sys_ids;

// 2. Set list of sys_ids's Operational State to 'Repair in Progress'
output =
    SNC.StateManagementScriptableApi.setBulkCIOperationalState(requestorId, sys_ids,'Repair in Progress');
gs.print(output);

// 3. Set list of sys_ids's CI Action State to 'Patching'
output =
    SNC.StateManagementScriptableApi.addBulkCIAction(requestorId, sys_ids, 'Patching');
gs.print(output);

Components installed by CI Lifecycle Management

Several types of components are installed by CI Lifecycle Management (included in the com.snc.cmdb plugin), including tables, scheduled jobs, and properties.

**Note:** To view all other components installed with this plugin, see the Application Files table. For instructions, see *Find components installed with an application.*

### Scheduled jobs installed

<table>
<thead>
<tr>
<th>Scheduled job</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CI Lifecycle Management - Restore Internal State Management Tables</td>
<td>Continuously checks and maintains the data integrity of all internal CI Lifecycle Management tables.</td>
</tr>
</tbody>
</table>

### Tables installed

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CI State Registered Users</td>
<td>All currently active registered users that were created via the registerOperator API. You cannot manually add new records to this table.</td>
</tr>
<tr>
<td>[statemgmt_register_users]</td>
<td></td>
</tr>
<tr>
<td>CI Actions</td>
<td>A set of CI actions that can be applied to a CI during its lifetime.</td>
</tr>
<tr>
<td>[statemgmt_ci_actions]</td>
<td></td>
</tr>
<tr>
<td>CMDB CI Actions</td>
<td>Active/inactive CI actions set by a specific requester for a specific CI. You cannot manually add new records to this table.</td>
</tr>
<tr>
<td>[statemgmt_cmdb_actions]</td>
<td></td>
</tr>
<tr>
<td>Compatible CI Actions</td>
<td>Set of rules that define pairs of CI actions that are compatible for a CI and can be applied simultaneously.</td>
</tr>
<tr>
<td>[statemgmt_compat_actions]</td>
<td></td>
</tr>
<tr>
<td>Not Allowed CI Actions</td>
<td>Set of rules that define specific actions that are not allowed for a CI when its in a specific operational state.</td>
</tr>
<tr>
<td>[statemgmt_not_allow_actions]</td>
<td></td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Internal Operational States [statemgmt_ops_state]</td>
<td>Internal operational states set by a specific active requestor for a specific CI. You cannot manually add new records to this table.</td>
</tr>
<tr>
<td>Renew Lease Task [statemgmt_renew_lease_task]</td>
<td>Set of tasks that were automatically created to renew the lease of CI actions whose lease has expired. You cannot manually add new records to this table.</td>
</tr>
<tr>
<td>Operational State Priorities [statemgmt_ops_state_pri]</td>
<td>Priorities of operational states which determine precedence when multiple operational states are set for same CIs by different requestors.</td>
</tr>
<tr>
<td>Not Allowed Operational Transitions [statemgmt_not_allow_ops]</td>
<td>Set of rules that define specific operational state transitions that are not allowed.</td>
</tr>
</tbody>
</table>

Properties installed

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.cmdb.statemgmt.max_lease_expired_days</td>
<td>Maximum number of days that lease expiration can be set with for CI Actions.</td>
</tr>
<tr>
<td></td>
<td>• Type: Numeric</td>
</tr>
<tr>
<td></td>
<td>• Default value: 15</td>
</tr>
<tr>
<td></td>
<td>• Location: System Property [sys_properties] table.</td>
</tr>
<tr>
<td>glide.cmdb.statemgmt.max_bulk_count</td>
<td>Maximum number of CIs that CI Lifecycle Management can process in a bulk update operation.</td>
</tr>
<tr>
<td></td>
<td>• Type: Numeric</td>
</tr>
<tr>
<td></td>
<td>• Default value: 1000</td>
</tr>
<tr>
<td></td>
<td>• Location: System Property [sys_properties] table.</td>
</tr>
</tbody>
</table>

Activate the CI Lifecycle Management scheduled job

When starting to use the CI Lifecycle Management module, ensure to activate the CI Lifecycle Management - Restore Internal State Management Tables scheduled job which is disabled by default. This scheduled job continuously checks and maintains the data integrity of all internal CI Lifecycle Management tables.

When CI Lifecycle Management operations do not complete properly, for example due to a failure of the requestor or a requestor whose lease has expired, the integrity of tables related to CI Lifecycle Management might be compromised. The CI Lifecycle Management - Restore Internal State Management Tables scheduled job scans tables related to CI Lifecycle Management, and does the following:

- De-activates or removes all internal lifecycle management records with invalid requestors, and closes any corresponding Renew Lease Tasks if present.
• Detects records associated with a valid requestor whose lease has expired, and automatically creates a Renew Lease Task to notify the user and to provide details for extending the lease. If the requestor takes no action and the lease remains expired for a specified grace period (default 15 days), automatically de-activates the corresponding CI action record, and closes any corresponding Renew Lease Task if present.

1. Navigate to System Definition, and click Scheduled Jobs.
2. Search for the CI Lifecycle Management - Restore Internal State Management Tables job.
3. In the respective Active column, double-click the value false, and select true.
4. Click the Save icon.

Define a CI action

Define a CI Lifecycle Management CI action that can be later applied to CIs.

You can view a list of all the actions that are currently applied to CIs by navigating to Configuration and clicking CMDB CI Actions.

1. Navigate to Configuration CI Lifecycle Management CI Actions.
2. On the CI Actions page, click New. Fill in Name and Description, and then click Submit.

Define compatible CI actions

Allow a CMDB CI Lifecycle Management operation in which two specified CI actions can be applied simultaneously to a CI.

By default, it is not allowed to apply more than a single action to a CI. You can change that behaviour by defining pairs of CI actions as compatible and therefore these actions can be applied simultaneously to a CI. For example you can specify that Provisioning and Patching are compatible CI actions, which lets you apply both to a CI at the same time.

1. Navigate to Configuration, and click Compatible CI Actions.
2. On the Compatible CI Actions page click New and fill out the form.

Table 23: Compatible CI Actions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action</td>
<td>First action in the compatibility actions pair.</td>
</tr>
<tr>
<td>Compatible Action</td>
<td>Second action in the compatibility actions pair.</td>
</tr>
</tbody>
</table>

An API can successfully apply the two specified actions simultaneously to a CI.

Define a not-allowed CI action

Define a restriction for CI Lifecycle Management in which a specified action is not allowed for a CI that is in a specified operational state.

By default, there are no restrictions in the CMDB CI Lifecycle Management on applying CI actions. You can restrict this behaviour by not allowing a specified action to be applied to a CI when it is in a specified operational state.
operational state. For example, you can define a restriction in which the provisioning action cannot be applied to a Linux Server that is in a non-operational state.

1. Navigate to Configuration CI Lifecycle Management Not Allowed CI Actions.
2. Click New on the Not Allowed CI Actions page, and fill out the form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Allowed Action</td>
<td>The action that is being restricted.</td>
</tr>
<tr>
<td>CI Type</td>
<td>The CI type for which the restriction applies to. To apply a rule to all CIs, select Configuration Item.</td>
</tr>
<tr>
<td>Operational State</td>
<td>The operational state that the CI must be at in order to apply the restriction.</td>
</tr>
</tbody>
</table>

3. Click Submit.

If an API attempts to apply the specified action to the specified CIs, while it is in the specified operational state, the operation fails and an error is logged.

Set priority for an operational state

CI Lifecycle Management allows multiple operators or automations to simultaneously set different operational states for a CI. A CI can have only a single operational state, so in this case, the cumulative operational state of the CI is set to the one with the highest priority. It is recommended that you specify a priority for each operational state that you define so that a cumulative state can be correctly calculated.

1. Navigate to Configuration CI Lifecycle Management Operational State Priority.
2. On the Operational State Priority page, click the operational state for which you want to set or update priority.
3. Enter a Priority and click Update.
   Smaller numbers represent higher priority.

Define a non-allowed operational transition

Define a restriction for CI Lifecycle Management in which a specified CI cannot transition from one operational state to another.

By default, CI Lifecycle Management has no restrictions for transitioning CIs from one operational state to another. You can restrict this behaviour by defining transitions that are not allowed for a specified CI. For example, you can define a restriction on transitioning a Linux server from non-operational state to repair in progress state.

1. Navigate to Configuration CI Lifecycle Management Not Allowed Operational Transitions.
2. On the Not Allowed Operational Transitions page, click New and fill out the form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CI Type</td>
<td>The CI type for which the restriction applies.</td>
</tr>
<tr>
<td>Not Allowed Transition</td>
<td>The CI state into which transitioning is restricted.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>Operational State</td>
<td>The operational state that the CI must be in for the restriction to apply.</td>
</tr>
</tbody>
</table>

If an API attempts to transition a CI that is in the specified operational state to a state that is not allowed, the operation fails and an error is logged.

**CMDB groups**

A CMDB group is a collection of CIs that lets you apply CI actions collectively to all the CIs that are members in the group. For example, a CMDB CI Lifecycle Management API can use a CMDB group scriptable API to retrieve the group's list of CIs, and then apply a CI Lifecycle Management action collectively to all the CIs.

**Group type**

A CMDB group is configured with a group type. If a CMDB group is set with the Health group type, then the CIs in the group can be monitored by CMDB Health, and the aggregated health is reported for the group as a whole in the CMDB group view dashboard. For example, you can monitor health only for CIs in a specific location.

**Populate a CMDB group**

Depending on the group type, you can populate a CMDB group by manually adding individual CIs, selecting saved CMDB queries, or building encoded queries in the CMDB group itself. The resulting CIs from each query are added as members to the group.

Roles required:
- To view CMDB groups - itil
- To use a CMDB queries - cmdb_query_builder on top of itil
- To manually add CIs - itil or asset

Also, to populate a CMDB group using a CMDB query, a saved CMDB query must exist.

1. Navigate to Configuration CMDB Group.
2. In the CMDB Groups pane click New.
3. Fill out the form, right-click the title bar and select Save.

**Table 24: CMDB Group form**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Name</td>
<td>A unique name for the group.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Group type</td>
<td>• Default: Basic group type which can be populated by manually adding CIs, saved queries, and encoded queries.</td>
</tr>
<tr>
<td></td>
<td>• Health: Sets CMDB Health to monitor the health of the group CIs and aggregate health results for the group as a whole. Can be populated only by encoded queries.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Dynamic filters are not supported when populating this type of CMDB groups.</td>
</tr>
</tbody>
</table>

4. To use saved CMDB queries:
   a) Click CMDB Group Contains Saved Queries and then click Add Query.
   b) Select a query from the Query Builder Saved Query list.
   c) Click Submit.

   The query that is used returns a list of CIs of the class in the start node of the query.

5. To manually add CIs:
   a) Click CMDB Group Contains Configuration Items and then click Edit Manual CI.
   b) Optionally add filters.
   c) Select CIs in the Configuration Item list and click the ‘+’ icon at the bottom.
   d) In the Group members list, select the CIs to add to the group.
   e) Click Save or Save and Exit.
   f) In the Save Confirmation dialog box, click OK.
   g) Click Submit.

6. To use encoded queries:
   a) Click CMDB Group Contains Encoded Queries and then click New.
   b) Select a class for which the encoded query applies to and add conditions to build a query. The resulting CIs are included in the group.

   **Note:** Dynamic filters are not supported for CMDB health-type groups, even though it is possible to add them in a condition clause.

   c) Click Submit.

Click Show All CI to display all CI members of the group.

**Show CI Lifecycle Management details for CMDB group CIs**

Display CI Lifecycle Management operational state and CI actions that apply to the CIs that are members of a CMDB group.
If the CMDB group is based on a CMDB query, then the query runs in real-time and displays the resulting CIs. If the query does not complete successfully due to timing out or for other reasons, then appropriate error messages are displayed.

1. Navigate to Configuration CMDB Groups.
2. On the CMDB Groups page, click on a CMDB group.
3. Click Show All CI.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration Item</td>
<td>CI group member.</td>
</tr>
<tr>
<td>Class</td>
<td>Class of CI group member.</td>
</tr>
<tr>
<td>Operational Status</td>
<td>CI Lifecycle Management operational state of the CI such as 'Repair in Progress' or 'Operational'. Possible operational states are defined in the choice list of the Operational status field in the cmdb_ci table.</td>
</tr>
<tr>
<td>Actions</td>
<td>CI Lifecycle Management actions that apply to the CI such as 'Cloning' and 'Provision'. Possible actions are defined in the CMDB CI Actions [statemgmt_cmdb_actions] table.</td>
</tr>
</tbody>
</table>

CMDB Identification and Reconciliation

The Identification and Reconciliation module provides a centralized framework for identifying and reconciling data from different data sources. It helps maintain the integrity of the CMDB when multiple data sources such as EventManagement, Discovery, ImportSets, and ManualEntry are used to create and update CI records.

The use of multiple sources increases the risk of introducing inconsistencies through duplicate records. To maintain the integrity of the database, it is important to correctly identify CIs and services so that new records are created only for CIs that are truly new to the CMDB. Identification and Reconciliation helps you prevent duplication of CI records, reconcile CI attributes, reclassify CIs, and allow only authoritative data sources to update the CMDB.

Domain Separation

The identification process is domain aware. If the domain separation plugin has been activated, then identification processes only those CIs in which the domain ID is identical to the domain of the currently logged on user. If duplicate CIs exist across domains (including parent and child domains), then those CIs are not considered duplicate CIs because their domain IDs do not match.

Domain separation in CMDB Identification and Reconciliation

This is an overview of domain separation and the CMDB Identification and Reconciliation feature. Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.
Overview

This topic explains how domain separation is enforced during the CMDB Identification and Reconciliation process. In addition this topic addresses how domain separation is applied to the Identification and Reconciliation rules.

Domain separation is supported in this application. Not all ServiceNow applications support domain separation; some include limitations on the data and administrative settings that can be domain separated. To learn more, see Application support for domain separation.

How domain separation works in Identification and Reconciliation

Domain separation in the identification engine is enforced as soon as users activate the domain separation plugin.

Domain separation during the Identification and Reconciliation Process

• Domain separation during the Identification/Reconciliation process is enforced through the domain ID.
  • Domain IDs do not need to be explicitly sent in the input payload of the identification engine APIs. Internally, the identification engine causes the current domain ID of the user to call the identification engine APIs.
  • Only CIs that have the same domain ID as the currently logged-in user’s domain display during matching.
  • During matching, if no records are found and a CI needs to be inserted, the CI’s domain ID is the same as the domain ID of the currently logged-in user’s domain.
  • During matching, if duplicates are found, De-Duplication tasks created in the [reconcile_duplicate_task] table, have the same domain ID as those of the duplicate CIs.
  • Duplicate CIs that exist across domains (including parent and child domains) are not considered as duplicate CIs by the identification engine.
  • During matching, if reclassification of the CI is not allowed, reclassification tasks are created in the [reclassification_task] table, with the same domain ID as the CI for which reclassification is needed.

Domain separation and Identification Rules

• The identification rules and identification inclusion rules used during the identification process are always defined at the global level. For example, the tables below do not have a sys_domain field:
  • Identifier (cmdb_identifier), Identifier Entries (cmdb_identifier_entry), Related Entries (cmdb_related_entry), and Identification Inclusion Rules (cmdb_ie_active_config).

Domain separation and Reconciliation Rules

• The reconciliation definition rules and data source precedence rules that are used during the reconciliation process can be defined for different domains. For example, the tables below do have sys_domain, sys_overrides, sys_domain_path fields:
Identification and reconciliation components and process

The CMDB identification and reconciliation functionality is supported by identification rules, reconciliation rules, de-duplication tasks, and reclassification tasks.

Components of Identification and Reconciliation

Identification

Identification is the process of uniquely identifying CIs, to determine if the CI already exists in the CMDB or if it is a newly discovered CI that must be added to the CMDB. The identification engine performs identification processes, relying on identification rules.

Reconciliation

Reconciliation is the process of reconciling CIs and CI attributes by allowing only designated authoritative data sources to write to the CMDB at the CI table and attribute level. The CMDB is updated in real time as records are being processed. There is no staging area to verify the reconciliation activities before they are committed. The process relies on reconciliation rules.

De-duplication tasks

If the instance encounters duplicate CIs during the identification and reconciliation process, it groups each set of duplicate CIs into a de-duplication task. Review the information in these tasks to see how it was determined that these CIs are duplicates.

Reclassification tasks

During the CI identification process, a matched CI might need to be upgraded, downgraded, or switched to another CI class. If automatic reclassification is disabled, then the system generates a reclassification task. Review the information in these tasks, and decide whether a manual reclassification of the CI is appropriate.

APIs

The Identification and Reconciliation APIs are a centralized set of APIs that can be used with different sources of data such as Discovery, Monitoring, or Import Sets. You can use it to enforce identification and reconciliation before data is stored in the CMDB. Data sources do not directly write to the CMDB. Instead, they call the APIs first to ensure that the data being written does not introduce inconsistencies.

Identification engine APIs are accessible in scoped apps. See Activate Configuration Management.
For Scoped Apps (CMDB) on page 109 for information about how to activate the plugin, and how to script a scoped app to access those APIs.

- `createOrUpdateCI()`: A scriptable API that creates or updates a CI based on identification and reconciliation rules.
- `IdentifyCI()`: Similar to the `createOrUpdateCI` API, but does not commit the result to the database. Use this API with a given payload to find out if the identification engine will perform insert or update operations, without committing the operation.
- `CMDBTransformUtil`: An API to be used exclusively with Import Sets to apply identification and reconciliation processes to data imported by Import Sets.

Predefined identification and reconciliation rules are included for tables that are in the base instance. You can customize these rules for your organization. When a new table is created in the CMDB, it derives identification and reconciliation rules from its parent table if these rules exist. To apply identification and reconciliation rules to a new table, create the rules either at the child level or at its parent level.
Activate Configuration Management For Scoped Apps (CMDB)

You can activate the Activate Configuration Management For Scoped Apps (CMDB) plugin (com.snc.cmdbscoped) to allow a scoped app in scripts to use the prefix ‘sn_cmdb.IdentificationEngine.<method>’ to access identification engine APIs. This plugin does not include demo data and activates related plugins if they are not already active.

Role required: admin

1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.
   - If the plugin depends on other plugins, these plugins are listed along with their activation status.
   - If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).
4. If available, select the Load demo data check box.
   Some plugins include demo data—Sample records that are designed to illustrate plugin features for
   common use cases. Loading demo data is a good practice when you first activate the plugin on a
development or test instance.
   You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related
link on the System Plugin form.
5. Click Activate.

Apply CI Identification and Reconciliation to Import Sets

You can apply CMDB Identification and Reconciliation processes when Import Sets are used to import CIs
into the CMDB. CI identification can prevent duplicate CIs in the CMDB, which Import Sets might otherwise
cause.

Populating CMDB tables using Import Sets can inadvertently result in duplicate CIs when multiple imported
records are identical to an existing CI. To minimize this duplication, you can apply CMDB Identification and
Reconciliation processes to Import Sets when importing new records into CMDB tables.

Transform map script

In the onBefore transform map script for an import set, add a call to the `CMDBTransformUtil` API, similar to
the following code sample:

```javascript
(function runTransformScript(source, map, log, target) {
    // Call CMDB API to do Identification and Reconciliation of current row
    var cmdbUtil = new CMDBTransformUtil();
    cmdbUtil.identifyAndReconcile(source, map, log);
    ignore = true;

    if (cmdbUtil.hasError()) {
        var errorMessage = cmdbUtil.getError();
        log.error(errorMessage);
    } else {
        log.info('IE Output Payload: ' + cmdbUtil.getOutputPayload());
        log.info('Imported CI: ' + cmdbUtil.getOutputRecordSysId());
    }
})
```

The ignore = true code phrase prevents Import Sets from creating the same record again after it is
processed by the identification engine.

Process

The identification engine performs identification of each source record before it is inserted into the CMDB.
The identification engine determines if the record is a duplicate of an existing CI, and then:

- If not duplicate: Inserts the record to the target table.
- If duplicate: Updates the existing CI in the CMDB, with data from the source record.

The CMDBTransformUtil API pre-processes the source data. Then passes the input values to the
identification engine with import set being the data source by default. The CMDBTransformUtil API
supports a target field that is a reference field in the same manner that Import Sets supports it. The
CMDBTransformUtil API also supports a source script, evaluating source scripts to determine the target
value which is then passed to the identification engine. For more information, see Create a field map.
Restrictions

The following restrictions apply:

• An import set should be associated with a single transform map. While adding a call to the CMDBTransformUtil API, ensure that still a single transform map exists for the import set.
• The CMDBTransformUtil API does not check if mandatory fields have values when used with Import Sets. Regardless of how enforce mandatory fields is set in the transform map, data import fails if a mandatory field does not have a value.
• CI Identification and Reconciliation cannot be applied to Import Sets for dependent CIs (CIs with dependent identification rules).

CMDB identification rules

The CMDB identification process relies on identification rules to uniquely identify CIs.

An identification rule applies to a CI class and consists of a single CI identifier and one or more identifier entries and related entries, each with a different priority. Each identifier entry defines a unique attribute set with a specific priority and each related entry defines rules for identifying related items. Create strong identification rules that are set with the highest priority for the strongest identifier entries and related entries.

The identification process and identification rules use the CIs attributes for identification:

| Unique attributes | Designated sets of criterion attribute values of a CI, that can be used to uniquely identify the CI. Unique attributes can be from the same table or from derived tables. |
| Required attributes | Designated attributes of a CI that cannot be empty. |

Identification rule types

The steps for identifying dependent CIs can be different from the steps for identifying independent CIs. This difference is reflected in the differences between dependent identification rules and independent identification rules.

| Independent identification rule | A rule that identifies a CI based on the CI's own attributes, independently of other CIs or relationship. |
| Dependent identification rule | A rule in which identifying a CI requires identifying a dependent CI first. A CI can have dependency on one or more CIs, and a dependent CI can have only a single parent CI with dependency. The relationship types between the CI and its dependent CIs are also included in the identification process. To help with the identification process of dependent CIs, create dependent relationships that define the dependency chain within CI types. The payload used for identification of a dependent CI, can include a relationship with a qualifier chain. For such relationship, if there is a matching parent/child pair, the system compares the qualifier chain in the payload, with the qualifier chain of the CIs in |
the database. If there is a difference, the qualifier chain in the database is updated to match the qualifier chain in the payload for that relationship.

Identifier entries

You can configure an identifier entry to match a CI not only based on the CI's own attributes (field based identification) but also based on the CI's related list (lookup based identification) such as Serial Numbers or Network Adapters. The lookup based table that is used for identification, needs to have a reference field that points to cmdb_ci.

There are two types of identifier entries:

**Regular identifier entry**
Based on CI's attributes that uniquely identify the CI.

**Lookup identifier entry**
Uses a related table (lookup table) which can be any table that has a reference to the CI that is being identified. After you select a related table in the lookup identifier entry, the list in Referenced field is populated with fields from the related table that reference either the cmdb_ci table itself, or one of its descendants.

Guidelines for lookup tables

Follow these guidelines when specifying a lookup table in an identifier entry.

1. Ensure that lookup tables reference the cmdb_ci table.
2. It is preferable to enforce exact count match (check box Enforce exact count match (Lookup)) for a stronger identification rule. During lookup identification, this option enforces matching only on exact lookup records count match.
3. Do not create conflicting identification rules especially for lookup based rule.

Example: In a CI Identifier for the Hardware class you specify a lookup based rule for the Network Adapter class, and you also define a CI Identifier for the Network Adapter class. Duplicates might potentially be created in the Network Adapter table, because there are contradicting rules to identify a unique CI in that table:

- One rule that looks only at criterion attributes (CI identifier rule)
- Another rule that looks at criterion attributes and referenced sys_id (lookup rule).

Example: CI with related items that needs to be inserted - sysId is available.

```javascript
var payload = {
  items: [{
    className: 'cmdb_ci_linux_server',
    related: [{
      className: 'cmdb_ci_spkg',
      values: {
        name: 'package1',
        version: 'version1'
      }
    }],
    values: {
      sys_id: '194876usytrr65378098'
    }
  }]
};
```
Related entries

You can also define related entries which are rules that are based on related CIs. A related entry is based on a related table which can be any table that has a reference to the CI that is being identified. After you select a related table for the rule, the list in Referenced field is populated with fields from the related table that reference either the cmdb_ci table itself, or one of its descendants.

Create or edit a CI identification rule

Identification rules are used to uniquely identify CIs in the CMDB, as part of the identification and reconciliation process. Each CMDB class can be associated with a single identification rule.

Role required: itil has read access, itil_admin (on top of itil) has full access.

In a CI identification rule, specify a CI identifier, and identifier entries and related entries that uniquely identify the CI. You cannot use the CI Class Manager to create related entries for an identification rule, you need to add those directly to the cmdb_identifier table.

Review the following before creating identification rules:

- CMDB identification rules on page 111
- Effective usage of CMDB Identification on page 131

1. Navigate to Configuration CI Class Manager.
2. Click Hierarchy to display the CI Classes list. Select the class for which to create an identification rule.
3. In the class navigation bar, expand Class Info and then click Identification Rule.
4. Click Edit to edit an existing rule, or click Add in the Identification Rule section to create one. Fill out the form, and then click Save.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent/Dependent</td>
<td>Designation of whether the CI identifier can identify the CI independently of other CIs, or not.</td>
</tr>
<tr>
<td>Name</td>
<td>Name of CI identifier.</td>
</tr>
<tr>
<td>Description</td>
<td>Description of the CI identifier.</td>
</tr>
</tbody>
</table>

Note: To set the rule as Dependent, you must specify dependent relationship rules for the selected class.

5. In the Identifier Entries section, click an existing identifier entry to edit, or click Add to create one.
6. Fill out the details in the Identifier Entry dialog box to specify criteria for matching a CI, and then click Save.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Search On Table</td>
<td>The lookup table:</td>
</tr>
<tr>
<td></td>
<td>• For a regular identifier entry: Select the same table as the table specified in Applies to on the Identifier form.</td>
</tr>
<tr>
<td></td>
<td>• For a lookup identifier entry: Select a table that is different from the Applies to table specified on the Identifier form. Also, the lookup table must have a reference field to cmdb_ci, otherwise the identifier entry is considered invalid.</td>
</tr>
<tr>
<td></td>
<td>The Rule Info and the Lookup Info tabs appear.</td>
</tr>
<tr>
<td>Priority</td>
<td>Priority of the identifier entry. Identifier entries are applied based on priority. Rules with lower priority numbers are given higher priority. Identifier entries of identical priorities are applied randomly.</td>
</tr>
<tr>
<td></td>
<td>It is recommended that you keep gaps between the priority numbers, so you can assign the unused priority numbers to new entries without modifying the existing priority order.</td>
</tr>
<tr>
<td>Criterion attributes</td>
<td>Set of attributes that uniquely identify the CI. Attributes can belong to the current class, or to a parent class.</td>
</tr>
<tr>
<td></td>
<td>Use the slushbucket to add or remove attributes from the identification rule.</td>
</tr>
<tr>
<td></td>
<td>It is not possible to add reference fields as a criterion attribute. Reference fields store sys_ids that point to a record in another table, and thus is considered a weak criterion attribute (in terms of uniqueness) for the current table.</td>
</tr>
<tr>
<td>Allow null attribute</td>
<td>Check box to allow null values for criterion and unique attributes.</td>
</tr>
<tr>
<td>Active</td>
<td>Check box that specifies the identifier entry is active. At least one identifier entry in an identification rule must be active for the rule to apply.</td>
</tr>
<tr>
<td>Allow fallback to parent's rules</td>
<td>Designation that the identification rules of the CI's parent are used if a match is not found for this identification rule. Applies only for dependent identification rules.</td>
</tr>
</tbody>
</table>
Note: If criterion attributes have only two attributes and sys_class_name is one of them (for example [name, sys_class_name], [ip_address, sys_class_name]), then the other attribute cannot be NULL, even if Allow null attribute is enabled. This restriction is due to sys_class_name being considered a special system matching attribute.

7. If Search On Table is set to a table that is different than the table on the Identifier form, then the Rule Info and the Lookup Info advanced tabs appear. Click Lookup Info and enter the information for a lookup identifier.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optional condition</td>
<td>A filter to narrow the set of records that will be searched for a matching CI. Applies only to lookup based identification.</td>
</tr>
<tr>
<td>Enforce exact count match (Lookup)</td>
<td>Indicates that for lookup identification, match only on exact lookup records count match.</td>
</tr>
</tbody>
</table>

8. Add related entries to the cmdb_identifier table.
   a) In the main platform navigation bar, navigate to Configuration Identification/Reconciliation, and click CI Identifiers.
   b) In the Identifiers view, locate and click the identification rule that you have been editing or creating.
   c) Click the Related Entries tab.
   d) In the Related Entries related list, click New or open an existing entry to specify a related entry for matching the related item. Fill out the form, and then click Submit.

Table 25: Related Entry form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifier</td>
<td>The CI identifier for which this related entry belongs to. By default it is set to the identifier you previously selected.</td>
</tr>
<tr>
<td>Related table</td>
<td>A related table that references the CI that is being matched.</td>
</tr>
<tr>
<td>Referenced field</td>
<td>A referenced field in Related table that should store the referenced CI. This field always reference the cmdb_ci table, or a descendent of the cmdb_ci table.</td>
</tr>
<tr>
<td>Criterion attributes</td>
<td>The set of attributes to uniquely identify the related item. Attributes can belong to the current class, or to a parent class. Click the lock icon to view, add, or remove attributes from the identification rule.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Optional condition</td>
<td>Use the Add Filter Condition and the Add &quot;OR&quot; Clause buttons to construct a filter to narrow the set of records that will be searched for a matching related item.</td>
</tr>
<tr>
<td>Active</td>
<td>Check box that specifies that the related entry is active.</td>
</tr>
<tr>
<td>Allow null attribute</td>
<td>Check box to allow null values for criterion and unique attributes.</td>
</tr>
<tr>
<td>Priority</td>
<td>Priority of the related entry for the specified Related table. Rules with lower priority numbers are given higher priority while matching a related item for specific related table. Related entries for the specified related table with identical priorities are applied randomly. It is recommended that you keep gaps between the priority numbers, so you can assign the unused priority numbers to new entries without modifying the existing priority order.</td>
</tr>
</tbody>
</table>

**Note:** If criterion attributes have only two attributes and `sys_class_name` is one of them (for example `[name, sys_class_name], [ip_address, sys_class_name]`), then the other attribute cannot be NULL, even if Allow null attribute is enabled. This restriction is due to `sys_class_name` being considered a special system matching attribute.

For example, the pre-defined Hardware Rule applies to the Hardware `[cmdb_ci_hardware]` table. It has an identifier entry with the criterion attribute Serial Number, Serial Number Type and its Search on table field is set to Serial Number.

The following payload snippet adds a CI to the `cmdb_ci_linux_server` class, that is a child of the Hardware class. It also shows how you can add related items in the payload for which you should create Related Entries on the CI Identifier page for the Hardware `[cmdb_ci_hardware]` table:

```json
{
    "items": [
        {
            "className": "cmdb_ci_linux_server",
            "lookup": [
                {
                    "className": "cmdb_ci_serial_number",
                    "values": {
                        "serial_number": "VMware-42 21 e3 da 44 15a a6-56 48 2b 0a 28 53 42 4c",
                        "serial_number_type": "system",
                        "valid": "true"
                    }
                }
            ]
        }
    ]
}
```
When the Hardware Rule is applied, the Serial Number [cmdb_serial_number] table is searched for a match with the values specified within the lookup key. Unless Enforce exact count match (Lookup) is checked, it is not necessary for every lookup key to return a match, as long as there is at least one match. If all matches reference the same CI, then that CI is considered to be the existing CI record. If no match is found, then the identification search continues to the next rule entry. If after all the rules are exhausted without finding a match, a new CI record is created in the database.

You can optionally create an inclusion rule to narrow the scope of CIs that are included in identification.

Create an identification inclusion rule

You can narrow the scope of CIs that are included in the identification process by creating an identification inclusion rule. If any identification inclusion rules exist, then they are automatically used also by the CMDB Health duplicate metric, in the same manner that health inclusion rules are used for other metrics.
Role required: itil has read access, itil_admin (on top of itil) has full access.

During duplication detection of independent CIs, the identification engine processes only the CIs that satisfy the identification inclusion rules. For example, you can include only CIs whose operational state is operational. When no identification inclusion rules exist, all CIs are included in the identification process and in the CMDB Health duplicate metric calculations. In the base system, there are no predefined identification inclusion rules. Identification inclusion rules are defined at the class level.

**Note:** Be careful when creating Identification inclusion rules. Identification inclusion rules can prevent the identification of certain types of CIs, affecting some features of Discovery and Service Mapping.

1. Navigate to **Configuration CI Class Manager**.
2. Click **Hierarchy** to display the CI Classes list. Select the class for which to create an identification inclusion rule.
3. In the class navigation bar, expand **Class Info** and then click **Identification**.
4. In the **Inclusion Rule (Advanced)** section, click **Add** to create a rule or click **Edit** to edit an existing rule. In the Create Inclusion Rules dialog box, specify a criteria in the **Active record condition** field. CIs must meet this criteria to be included in the identification process and in the duplicate CMDB Health metric.
5. Click **Save**.

**Reconciliation rules**

Reconciliation rules specify which data sources can update a table or a set of table attributes, and they can be defined at the parent and the child table level. Ensure that there is a reconciliation rule for each data source that is authorized to update an attribute - multiple reconciliation rules can exist for the same set of attributes.

Data sources are used with the `createOrUpdateCI()` API to simulate manual updates to CIs. EventManagement, ImportSet, ManualEntry, and Tivoli are examples of data sources.

As you create reconciliation rules, keep the following principles and guidelines in mind. These principles are designed for flexibility and the refinement of rules at the attributes level.

**Example reconciliation rules**

For example, you might have the following reconciliation rules. The rules are created for the `cmdb_ci_computer` table and one of its child tables, the `cmdb_ci_linux_server` table. The rules specify the following:

1. **Discovery** is exclusively authorized to update the name attribute in the `cmdb_ci_computer` table.
   
   Because reconciliation rules are derived by child tables from parent tables, this rule also authorizes Discovery to update the name attribute in any child tables for the `cmdb_ci_computer` table.

2. **ServiceWatch** is exclusively authorized to update the name attribute in the `cmdb_ci_linux_server` table.

3. **ServiceWatch** is exclusively authorized to update all attributes in the `cmdb_ci_linux_server` table, as configured by leaving the Attributes field empty in the rule.
Authorization for all attributes in a table

If you want to authorize a data source to update all attributes in a table, leave the attribute list empty in the reconciliation rule for the data source. However, this authorization can be overridden for some of the attributes by rules for child tables in which specific attributes are listed.

For example, if only example rules #1 and #3 are created, then Discovery is authorized to update the name attribute in the cmdb_ci_linux_server table. ServiceWatch is authorized to update all other attributes in the table except for the name attribute.

To override the authorization of Discovery to update the name attribute, example rule #2 is added to specifically authorize ServiceWatch to update the attribute.

Authorization to only specific attributes in a table

If you want to authorize a data source to update specific attributes in a table, list these attributes in the reconciliation rule for the data source. A rule that grants access to specific attributes in a table overrides other rules with an empty attribute list that grants access to the entire table.

Example rule #1 grants Discovery with exclusive authority to update the name attribute of the cmdb_ci_computer table. All other data sources are prevented from updating the name attribute of any CI in the cmdb_ci_computer table.

Child table rules overrides parent table rules

Any reconciliation rules defined for a child table override the rules defined for its parent table.

For example, rule #1 lets Discovery update the name attribute in the cmdb_ci_computer table and all of its child tables. However, rule #2 for the cmdb_ci_linux_server child table, which overrides rule #1 for the parent table, explicitly authorizes ServiceWatch to update this attribute in the child table.

As a result:
- Discovery cannot update the name attribute of the child cmdb_ci_linux_server table. Only ServiceWatch is authorized to update this attribute.
- Discovery is authorized to update the name attribute of CI records in all other child tables of the cmdb_ci_computer table.

Overlapping rules

Rules that authorize different data sources for the same attributes of the same table can coexist and do not exclude each other.

For example, assume the following rule is added. It is similar to example rule #1 but authorizes a different data source:

- ServiceWatch is authorized to update the name attribute in the cmdb_ci_computer table.

Like example rule #1, this new rule applies to the name attribute in the cmdb_ci_computer table so both Discovery and ServiceWatch can update the attribute. Any applicable data source precedence rules are enforced to prevent the data sources from overwriting each other's updates.

Domain separation

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If Domain Separation is enabled, then you can scope reconciliation rules to specific domains. Rules of the parent domain, if not overridden, apply to CIs of child domain. All rules that are visible to a domain are applied, and a rule overriding the parent domain displays the child domain version.

Create or edit a CI reconciliation rule

A reconciliation rule specifies the attributes that a data source is authorized to update for a given table and prevents unauthorized data sources from overwriting the attributes’ values. If an attribute does not have any reconciliation rules created for it, data sources are allowed to overwrite each other’s updates to the attribute’s value.

Role required: itil has read access, itil_admin (on top of itil) has full access.

Reconciliation rules are used in conjunction with data refresh rules and data source precedence rules to determine reconciliation steps for a CI. These rules determine if, when, and by which data source a CI can be updated.

1. Navigate to Configuration CI Class Manager.
2. Click Hierarchy to open the CI Classes list. Then select a class for which to create a reconciliation rule.
3. In the class navigation bar, expand Class Info and then click Reconciliation Rules.
4. In the Reconciliation Rules section, click Add to create a rule or select an existing rule to edit.
5. In the Create Reconciliation dialog box, fill out the fields on the Rule Info tab, and then click Next.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
<td>The data source that you are configuring this rule for.</td>
</tr>
<tr>
<td>Active</td>
<td>Check box to activate this reconciliation rule.</td>
</tr>
</tbody>
</table>

6. In the Create Reconciliation dialog box, fill out the fields on the Attributes tab, and then click Next.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apply to All Attributes</td>
<td>Authorizes the specified source to update all table attributes.</td>
</tr>
<tr>
<td>Attributes</td>
<td>Attributes that the data source is authorized to update. You can select attributes from the current class, or a parent class. Available only if Apply To All Attributes is false.</td>
</tr>
<tr>
<td>Update with Null</td>
<td>Attributes that the data source can update with a null value. By default, authorized data sources cannot overwrite a non-null value with a null value. Attributes in this list, which are not in the Attributes list, are not included with the attributes that the data source can update with a null value.</td>
</tr>
</tbody>
</table>

7. In the Create Reconciliation dialog box, fill out the fields on the Filter Condition tab if applicable.
Field | Description
--- | ---
Filter Condition | Conditions that a CI must meet, in order for the rule to apply to that specific CI.
For example, to apply this rule only to CIs that are associated with the Finance department, select this condition: [Department] [is] [Finance]

8. Click Save.

Additional rules that affect reconciliation:
1. Define or edit data source precedence rules on page 121
2. Create data refresh rules on page 122

**Define or edit data source precedence rules**

If multiple data sources are authorized to update the same table or the same table attributes in the CMDB, assign a priority to each of these data sources to prevent them from overwriting each other's updates. Without data source precedence rules, data sources can overwrite each other's modifications.

Role required: itil has read access, itil_admin (on top of itil) has full access.

Data source precedence rules are used along with data refresh rules and reconciliation rules to determine reconciliation steps for a CI. These rules determine if, when, and by which data source a CI can be updated.

After an authorized data source updates an attribute, subsequent updates are accepted only from the same data source or from a data source with a higher priority. Updates from a data source with a lower priority are rejected, unless these two conditions are met:

- A higher priority data source previously updated the CI attribute.
- The CI became stale based on data refresh rules for the CI class.

Information about the last data source that updates each attribute is stored in the Data Source History [cmdb_datasource_last_update] table.

Data source precedence rules affect reconciliation of stale CI attributes. During reconciliation, the information in the Data Source History table is considered along with the data refresh rules for the CI's class, to determine if a CI attribute is stale. A CI attribute is determined to be stale if it was not updated by the latest data source to update the CI, within a time period. The time period is specified by the Effective Duration time in the data refresh rule for the class for the data source. In this case, if another authorized data source, with a lower priority attempts to update the stale CI attribute, the update is allowed.

**Note:** Users with the itil role have read access to the CI identification rules.

1. Navigate to Configuration CI Class Manager.
2. Click Hierarchy to display the CI Classes list. Select the class for which to create a data source precedence rule.
3. In the class navigation bar, expand Class Info and then click Reconciliation.
4. In the Data Precedence Rules section, click Add to create a rule or select an existing rule to edit. Fill out the details in the Create Precedence Rules dialog box.
Create data refresh rules

Specify data refresh rules to determine if a CI is stale for a specific data source. Such CIs can then be updated by a lower-priority authorized data source.

Role required: itil has read access, itil_admin (on top of itil) has full access.

Data refresh rules are used in conjunction with data source precedence rules and reconciliation rules to determine reconciliation steps for a CI. These rules determine if, when, and by which data source a CI can be updated.

1. Navigate to Configuration CI Class Manager.
2. Click Hierarchy to display the CI Classes list. Select the class for which to create a data refresh rule.
3. In the class navigation bar, expand Class Info and then click Reconciliation.
4. In the Data Refresh Rules section, click Add to create a rule or select an existing rule to edit. Fill out the details in the Create Data Refresh Rules dialog box.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data source</td>
<td>The data source of the class.</td>
</tr>
<tr>
<td>Effective Duration</td>
<td>The time period that is used for the staleness test. If the fields specified in the reconciliation rule for the CI's class were not updated by the specified data source within the specified time period — the CI is determined to be stale for that data source. If you enter a value with a prefix that is valid and a suffix that is not, such as 15 x — the valid portion of the value is used (&quot;15&quot;). If the entire value is invalid — the default value of 0 is used.</td>
</tr>
<tr>
<td>Active</td>
<td>Specifies that the rule is active.</td>
</tr>
</tbody>
</table>
Detecting duplicate CIs

When the identification process encounters duplicate CIs, it groups each set of duplicate CIs into a de-duplication task for review and remediation. A large number of duplicate CIs might be due to weak identification rules. You can configure the identification engine to reconcile duplicate CIs.

During CMDB Identification, processing of duplicate CIs is determined by the properties glide.identification_engine.skip_duplicates (set to true by default) and glide.identification_engine.skip_duplicates.threshold (set to 5 by default), and on the number of duplicate CIs that are detected. You can configure these properties so duplicate CIs are automatically reconciled, skipping duplication.

- If glide.identification_engine.skip_duplicates is true, and the number of duplicate CIs is less than the threshold specified by glide.identification_engine.skip_duplicates.threshold, then the oldest of the duplicate CIs is picked as a match and gets updated. The rest of the duplicate CIs are tagged as duplicates by setting the cmdb_ci's discovery_source field as ‘Duplicate’. During matching, the identification engine filters out any CIs in which state discovery_source = Duplicate.
- If glide.identification_engine.skip_duplicates is false, then matching of duplicate CIs fails with an error, and none of the duplicate CIs are updated.

Note: In either case, de-duplication tasks are always created.

To modify these properties, first add them to the System Properties [sys_properties] table. For more information, see Components installed with Identification and Reconciliation on page 133.

Review de-duplication tasks

For information about reviewing and remediating de-duplicate tasks, see Duplicate CIs on page 177.

Generate and simulate payload execution using identification simulation

Identification simulation is a central location for automatically constructing a payload that is guaranteed to be complete and valid. You can then simulate the processing of the payload by the identification engine and examine the results before actually submitting it for execution by the identification engine.

Use identification simulation to construct an input payload, and simulate processing of the payload by the identification engine. You can then examine the results, adjust identification rules if needed, and re-run the simulation of the updated payload.

Use the identification simulation to:

- Automatically construct input payload that is based on existing identification rules, hosting and containment rules.
- Simulate execution of a payload (automatically constructed by identification simulation, or manually created).
- Browse payload output and execution log messages for a simulated run.

Note: Identification simulation does not commit any updates to the CMDB, other than setting the discovery_source attribute to Duplicate for a CI that is determined to be duplicate.

Automatically generate payload using identification simulation

Use identification simulation to automatically construct an input payload for a specified class. The constructed payload is complete with any required dependent CIs, correctly structured, and syntactically valid for processing by the identification engine.
Role required: itil

The payload that is constructed during identification simulation is for the specified class. For a dependent CI class, you will be prompted for information about all dependencies. After you provide the required details, identification simulation constructs the payload based on your input.

1. Navigate to Configuration Identification Simulation.
2. In the Start with CI Class box click Start.
3. On the Payload Information form, in the Source field, select the data source that is associated with this class update.
   For the ServiceNow Discovery data source, select ServiceNow.
4. Select the Class in the payload.
   a) In the Criterion Attributes area select the CI identifier attributes and then specify the values that uniquely identify a CI.
   b) In the Additional Attributes area specify attributes and values that matching CIs will be updated with.
5. For dependent CIs associated with dependent identification rules, fill out the Criterion Attributes and Additional Attributes sections in all Container level sections that display.
6. Click Generate. If any errors indicate that there are missing fields, fill in the missing fields and then click Generate again.
7. You can optionally click Execute to simulate processing of the payload by the identification engine.

Examine the results of the simulation, fine-tune the payload as needed, and combine with other payloads for other classes as desired. After finalizing the payload, use the `createOrUpdateCI()` API to execute the payload by the identification engine which will result in actual updates to the CMDB.

Simulate payload processing using identification simulation

Use identification simulation to simulate the identification engine process of CI identification for an input payload. Provide a valid payload, which was constructed using identification simulation or that was created manually.

Role required: itil

1. Navigate to Configuration Identification/Reconciliation, and click Identification Simulation.
2. To execute an existing payload:
   a) Click Start in the Start with Existing Payload tile.
   b) In the Source field, select the data source that is associated with this class update.
   c) Paste the JSON payload into the empty canvas.
3. Or, to construct a new payload click Start in the Start with CI Class tile. See Automatically generate payload using identification simulation on page 123 for more information.
4. Click Execute to simulate processing of the payload by the identification engine.

1. Examine the results of the simulation in the results pane, and fine-tune the payload as needed:
   a. Click Run #1 to display the Context ID and the Run ID of the simulated run.
   b. Click the drop down arrow next to Run #1 to display additional details.
      • Input: Displays the payload for the simulation.
      • Logs: Displays all the logged messages that the identification engine generated while simulating processing of the payload, according to the specified logging level.
• Output: Displays the output payload returned by the identification engine.

2. After finalizing the payload, use the `createOrUpdateCI()` API to execute the payload by the identification engine which will result in actual updates to the CMDB.

Set logging level for identification simulation

Identification simulation logs each step of a simulated payload processing. You can then examine these run logs to determine if a payload was processed as expected, and if identification rules are effective. You can adjust the level of logging so it is helpful, and so that the amount of messages is not excessive or insufficient.

Role required: itil

1. Navigate to Configuration Identification Simulation.
2. Click the Settings icon.
3. Select logging level for the identification engine under IE Log Level and for the service cache under Service Cache Log Level.
   The logging levels are displayed in ascending order, from the minimum level to the maximum level of logging.
4. Click on the Settings icon again to close the Settings dialog box.

CI reclassification

During the CI identification process, a CI might need to be reclassified to a different sys_class_name type. By default, CIs are reclassified automatically. If automatic reclassification is disabled, then the CI is not reclassified and the system generates a reclassification task for your review.

A CI can be upgraded to a higher class, downgraded to a lower class, or switched to a different branch in the class hierarchy. For more details about reclassification operations, see `Reclassify a CI` on page 78.

You can configure CI reclassification behavior at a system-wide level or individually per CI.

Enabling and disabling automatic CI reclassification

You can use the `glide.class.upgrade.enabled`, `glide.class.downgrade.enabled`, and `glide.class.switch.enabled` properties to configure system-wide behavior for CI reclassification. These properties are set to true by default, enabling automatic reclassification. To disable automatic CI reclassification, set the respective properties to false.

Alternatively, you can control the reclassification behavior for individual CIs in the input payload of the `createOrUpdateCI()` API. In the payload, you can set these properties to true or false to temporarily override the respective property setting.

• classUpgrade
• classDowngrade
• classSwitch

The following sample JSON payload enables automatic reclassification for the specified CI:

```json
{ items: [{className: 'cmdb_ci_server', classUpgrade: true, classDowngrade: true, classSwitch: true, values: {name: 'linux123', serial_number: '12srt567', ip_address: '10.2.3.4'}}, ]}
```
View a reclassification task

When automatic CI reclassification is disabled, reclassification tasks are created for CIs that could not be automatically reclassified during the identification process. Review these tasks to locate the CIs and decide if to reclassify them.

Role required: admin or itil

1. Navigate to Configuration Identification/Reconciliation Reclassification Tasks.
2. Select a reclassification task.
3. Examine the details on the Reclassification Task form.

Table 26: Reclassification Task form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration item</td>
<td>The CI that must be reclassified.</td>
</tr>
<tr>
<td>Short description</td>
<td>Short description noting that CI reclassification was not allowed.</td>
</tr>
<tr>
<td>Description</td>
<td>Description noting the current class of the CI and the class that the CI must be changed to.</td>
</tr>
<tr>
<td>Internal payload</td>
<td>Payload used in the identification process.</td>
</tr>
</tbody>
</table>

After examining the task details, you can locate the CI that is noted in the task Description and manually reclassify it. For details, see Reclassify a CI on page 78.

CMDB dependent relationship rules

Service definitions consist of CI types and relationship types. Dependent relationship rules define the dependency structure of the CI types and the relationship types in these service definitions, helping in CI identification and in the construction of business service maps.

The dependencies that are defined by these rules are used when identifying dependent CIs to prioritize the order of CI identification, and to match CIs and respective dependent CIs in a payload. Dependent relationship rules are also used by Service Mapping and can be defined for custom CI types. After defining a new CI type, you can define dependent relationship rules that specify how the new CI type is related to existing types in the CMDB.

Dependent relationship rules consist of hosting and containment rules (dependent relationship rules), each type modeling the data from a different perspective of the CI. Containment rules represent CIs’ configuration hierarchy, describing which CI contains which other CIs. Hosting rules represent CIs’ placement in a business definition, describing what CIs run on.

Both hosting and containment rules describe a relationship type between two CI types and the same relationship type can be used in a hosting rule and in a containment rule. It is the context in which the relationship is used that distinguishes between a containment and hosting rule.

Manage dependent relationship rules:

- To access rules at the class level, use the CI Class Manager. Navigate to Configuration CI Class Manager.
- To access grouped rules, use the Metadata Editor. Navigate to Configuration Identification/Reconciliation Metadata Editor.
The plugins that have been activated on an instance determine which hosting and containment rules exist in a base system.

**Hosting rules**

Hosting rules represent all the possible valid combinations of pairs of hosting and hosted CIs in the service definition. Hosting rules are a flat set of rules that can be only one level deep, and which always involve resources, typically physical or virtual hardware. Each hosting rule is a stand-alone rule between two CI types, describing either a valid CI type that another CI type can host, or by which another CI type can be hosted. A hosting rule consists of a parent CI type, a relationship type (such as Hosted On::Hosts) and a child CI type. For example, you can have a hosting rule that specifies that the CI type ‘Application’ ‘Runs On::Runs’, the CI type ‘Hardware’.

A CI can be hosted on multiple resources (such as Windows and Linux). This CI is represented by a hosting rule for the CI with each resource that the CI can be hosted on. During CI identification, the pair of CIs that are being examined, should satisfy at least one hosting rule.

Hosting rules are stored in the CMDB Metadata Hosting Rules [cmdb_metadata_hosting] table.

**Containment rules**

Containment rules represent the containment hierarchy for a CI type, describing valid objects that a CI type can contain in the service definition, and valid objects that can be contained by the CI type. Containment rules are chained to each other in a containment rules group, with a CI type that is the top-level (root) parent of the group. The collection of containment rules construct a hierarchy-like map of containment relationships. Containment rules are logical concepts used to represent logical CIs, for example to describe software that runs on a server. A containment rule consists of a parent CI type, a relationship type (such as ‘Contained By::Contains’), and a child CI type. For example, you might have a containment rule specifying that the CI type ‘Tomcat’ ‘Contains::Contained By’ CI type ‘WAR File’.

Endpoints are special containment rules that specify incoming or outgoing connections in the model, designating the CI types that data of some specified type flows in to or out from the service definition. After adding an endpoint to a containment rule, you cannot add any child rules to the endpoint rule.

Containment rules are stored in the CMDB Metadata Containment Rules [cmdb_metadata_containment] table.

**Reference rules**

Reference rules are used mostly by Cloud Management to represent all of the possible valid combinations of pairs of referencing and referenced CIs in the service definition.

- Reference rules are a flat set of rules that can be only one level deep.
- Reference rules always involve resources, typically virtual entities. Each reference rule is a stand-alone rule between two CI types, describing either a valid CI type that another CI type can reference, or by which another CI type can be referenced. Both the CI classes should be able to live independent of each other.
- A referencing rule consists of a parent CI type, a relationship type (such as Provisioned From::Provisioned) and a child CI type. For example, you can have a referencing rule that specifies that the CI type ‘Virtual Machine’ Provisioned From::Provisioned, the CI type ‘Image’.
- A CI can reference multiple resources (for example, a VM Instance can have a reference relation with both the Image and the Hardware templates). This CI is represented by a referencing rule for the CI with each resource that the CI can be referenced from.
- The reference rule cannot be part of the CI identification.
• Reference rules are stored in the CMDB Metadata Reference Rules [cmdb_metadata_reference] table.

Rules requirements

The rules that you create are bound by the following requirements which narrow the relationships and ensure that only valid options are available in the drop-down lists in the Metadata Editor.

• Given a CI type that is as a child in a containment rule: Not this CI type or its children can be a top-level (root) parent of any other containment rule, and it cannot be in any hosting rule, either as a parent or as a child.
• Given a CI type that is a top-level (root) parent of a containment rule: It cannot be a child in a hosting rule (for example, you cannot be hosted on Tomcat, if Tomcat has any containment rules).
• Given a CI type that is a child in a hosting rule: It cannot be in any containment rule, either as a parent or a child.
• Given a CI type that is a parent in a hosting rule: It cannot be a child in any containment rule.
• Hosting rules cannot create loops such as Tomcat –runs_on- VMWare –runs_on- Tomcat.

Hosting and containment rules model

Hosting rules that model the diagram:
• Tomcat ‘Runs on’ Hardware

Containment rules that model the diagram:
• Tomcat ‘Contains’ Configuration File
• Tomcat ‘Contains’ WAR
• WAR has two endpoints for JDBC with MySQL:
  • Inbound
Valid set of rules

Tomcat Hosted Linux
Linux Hosted Computer

The second metadata entry triggers the third requirement, which is satisfied (it is a hosting rule, not a containment rule).

Create dependent relationships

Create hosting and containment rules (dependent relationship rules) for CI classes to help with correctly identifying dependent CIs during the business discovery process and service mapping. Discovery calls the identification API that applies dependent relationship rules.

You can create a basic hosting or containment rule in the CI Class Manager. Or, use the Metadata Editor to create groups of hosting and containment rules, and inbound or outbound endpoints in containment rules. The CI Class Manager and the Metadata Editor are synchronized, and you can use each of those tools to display and edit a dependent rule.

Create a dependent relationship rule for a CMDB class

Use the CI Class Manager to create a basic dependent relationship rule (hosting or containment relationship rule) for a CMDB class.

Role required: itil has read access, itil_admin (on top of itil) has full access.

The class for which you create dependent relationship rule, must have a dependent identification rule.

1. Navigate to Configuration CI Class Manager.
2. Click Hierarchy to display the CI Classes list, and select the class for which you want to create a hosting or a containment rule.
3. In the class navigation bar, click Dependent Relationships.
4. Click Add dependency.
5. Fill out the details in the Add Dependent Relationship Rule dialog box.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rule Type</td>
<td>One of the following:</td>
</tr>
<tr>
<td></td>
<td>• Hosting: Designates a hosting rule.</td>
</tr>
<tr>
<td></td>
<td>• Containment: Designates a containment rule.</td>
</tr>
<tr>
<td>This Class</td>
<td>The CI class that the rule applies to.</td>
</tr>
<tr>
<td>Relationship</td>
<td>The relationship type for the dependent relationship rule.</td>
</tr>
<tr>
<td>Target Class</td>
<td>The target class in the dependent relationship rule.</td>
</tr>
</tbody>
</table>

6. Click Save.
You can click Reset to derived and then confirm the operation to delete all dependent relationship rules that were added specifically for the selected class. Only dependent relationships that are derived from a parent class, remain.

For more information about child and parent classes, see Table extension and classes.

Create or edit a collection of containment rules
Create containment rule for CIs to help with correctly identifying dependent CIs during the business discovery process and service mapping. Discovery calls the identification API that applies dependent relationship rules.

Role required: admin

A containment rule is a dependent relationship rule which defines a relationship between two CIs, structured as: CIType1 RelationshipType CIType2. The first CI type that you add becomes the top level CI of a containment rules group which is a chain of containment rules. The entire set of containment rules is organized as groups according to top-level CIs.

To create a containment rules group for a new CI type, you need to first add the CI Type1 of the relationship. To add a child containment rule for a CI type that exists, you need to select that CI type, and define the second portion of the relationship rule which is the relationship type and CI Type2.

To each rule within a containment rules group you can add inbound or outbound endpoints, which are noted by blue up and down arrows. After adding an endpoint, you can not add a containment rule in that branch of the containment rules hierarchy.

1. Navigate to Configuration Metadata Editor.
2. In the Metadata Editor, click the Containment Rules tab.
3. Click Add New Rule to add a top-level rule. Or, point to a rule for which you want to add a child rule and click the green '+' icon that appears on the right.
4. Complete the Add Containment Rule to <class> form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration Item Type</td>
<td>The CI class that the rule applies to.</td>
</tr>
<tr>
<td>Relationship Type</td>
<td>The relationship type for the rule.</td>
</tr>
<tr>
<td>Reverse Relationship Direction</td>
<td>Enable to use the reverse relationship in the rule.</td>
</tr>
<tr>
<td>Always include in Service Model</td>
<td>Enable to always include the CIs of the specified class in the Service Map if their parent CI (based on the containment relationship) is present in the Service Map.</td>
</tr>
</tbody>
</table>

5. Click Create.
6. Add an endpoint to a child rule:
   a) Point to a child rule for which you want to add an endpoint.
   b) Click the blue "+" icon that appears on the right.
   c) Complete the Add Endpoint To <class> form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endpoint Type</td>
<td>The type of endpoint.</td>
</tr>
<tr>
<td>Inbound or Outbound</td>
<td>The direction of the endpoint.</td>
</tr>
</tbody>
</table>
Create or edit a collection of hosting rules

Create hosting rule for CIs to assist in correctly identifying dependent CIs during the business discovery process and service mapping. Discovery calls the identification API that applies dependent relationship rules.

A hosting rule is a dependent relationship rule which defines a relationship between two CIs, structured as: `<CI Type1> <relationship type> <CI Type2>`. To create a hosting rule, you need to add a CI type as `<CI Type1>` in the relationship rule, and then define the second portion of the relationship rule which is the relationship type and `<CI Type2>`. The entire set of hosting rules is organized as groups according to the top-level hosted CIs.

A hosting rule implicitly contains two rules, which are the reversal of each other. When you create the rule `'<CI Type1> <relationship type> <CI Type2>'`, the rule `'<CI Type2> <reversed relationship type> <CI Type1>'` is automatically added.

Role required: admin

1. Navigate to Configuration Metadata Editor.
2. In the Metadata Editor, click the Hosting Rules tab.
3. Click Add New Rule to add a top-level rule. Or, point to a rule for which you want to add a child rule and click the green '+' icon that appears on the right.
4. Complete the Add Hosted/Hosting Rule to <class> form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration Item Type</td>
<td>The <code>&lt;CI Type2&gt;</code> in the rule.</td>
</tr>
<tr>
<td>Relationship Type</td>
<td>The relationship type for the rule.</td>
</tr>
<tr>
<td>Reverse Relationship Direction</td>
<td>Check to reverse relationship in the rule.</td>
</tr>
</tbody>
</table>

5. Click Create.

Effective usage of CMDB Identification

Use CMDB Identification effectively.

Identification rules

An independent identification rule identifies a CI based on the CI's attributes, independently of other CIs.

A dependent identification rule identifies a CI by its dependent CIs and the relationships of the identified CI with those dependent CIs. Identification with a dependent identification rule is based on the dependent CIs and the relationships and qualifiers between the identified CI and its dependent CIs. Identification then requires more time than with an independent identification rule and is prone to some identification errors. Usage of dependent rules should therefore be minimized.

CI modeling determines which type of identification rules are required for proper CI identification.

Create identification rules using the following order of importance:

1. Independent identification rules — It is always preferable to create independent identification rules rather than dependent identification rules. When you model a CI, define the CI with a complete set of attributes that lend themselves to independent identification, eliminating the need to use additional CIs for identification.
2. Dependent identification rules — If it is necessary to create dependent identification rules, then define a single level of dependency. Two is the maximum number of dependency levels that is supported.

3. Avoid creating lookup identifier entries. The use of lookup identifier entry is highly discouraged as it can reduce performance. If unavoidable, ensure to first review class definitions and consider updates that allow usage of independent identification rules.

4. Limit the number of identifier entries within an identification rule, ideally to 1. A second identifier entry can further reduce performance, as will each additional identifier entry.

5. Create strong identification rules in which the strongest identifier entries and related entries are set with the highest priority.

6. Ensure that the identification rule is at the class level that it needs to be.

**Payload**

Create the payload using the following order of importance:

1. Payload size — Limit the number of CIs per payload to 500.

2. Avoid duplicate entries in the payload.  
   
   Example: If an identification rule has a criterion attribute for the name field, then the following payload has duplicate items resulting in failure:

   ```javascript
   var payload = {
     items: [{
       className:'cmdb_ci_linux_server',
       values: {
         name:'Win Server 200',
         ram:'2048'
       }
     },
     {
       className:'cmdb_ci_linux_server',
       values: {
         name:'Win Server 200',
         ram:'4096'
       }
     }]
   };
   ```

3. Do not pass system data such as the following in the payload.

   ```javascript
   var payload = {
     items: [{
       className:'cmdb_ci_linux_server',
       values: {
         name:'Win Server 200',
         sys_domain:'global',
         sys_domain_path:'xyz',
         sys_updated_on:'2017-06-15 16:25:11',
         sys_mod_count:23,
       }
     }]
   };
   ```

4. Provide the minimum necessary set of criterion attributes for each payload item, according to what is specified in the corresponding identification rules.

5. When matching CIs, use CIs' sysIds if available.
   
   - Example: Independent CI that needs to be updated — sysId is available.

   ```javascript
   var payload = {
     items: [{
       className:'cmdb_ci_linux_server',
       ```
values: {
    sys_id:'194876usytrr65378098',
    ram:'2048',
    }]
});

• Example: Dependent CI that needs to be inserted. Tomcat War CI depends on Tomcat CI, and Tomcat CI depends on Linux Server CI. SysIds for the Tomcat and the Linux CIs are available.

```javascript
var payload = {
    items: [
        { 
            className:'cmdb_ci_app_server_tomcat_war',
            values: { 
                name:'war1',
                short_description:'my description'
            }
        },
        { 
            className:'cmdb_ci_app_server_tomcat',
            values: { 
                sys_id:'194876usytrr65378098'
            }
        },
        { 
            className:'cmdb_ci_linux_server',
            values: { 
                sys_id:'09876tysueyt6345lakiu'
            }
        }
    ],
    relations: [
        { 
            parent:1,
            child:0,
            type: 'Contains::Contained by'}, { 
            parent:1,
            child:2,
            type:'Runs on::Runs'
        }
    ]
};
```

• Example: Dependent CI that needs to be updated — sysId is available.

```javascript
var payload = {
    items: [
        { 
            className:'cmdb_ci_app_server_tomcat_war',
            values: { 
                sys_id:'039387euey637465sytet',
                short_description:'my description new'
            }
        }
    ]
};
```

6. When inserting many CIs, all of which depend on the same CI, you should serialize your API calls. Otherwise, attempting to concurrently process many CIs can clog the system, significantly degrading overall system performance.

Components installed with Identification and Reconciliation

Several types of components are installed with Identification and Reconciliation (included in the com.snc.cmdb plugin), including tables and properties.

**Note:** To view all other components installed with this plugin, see the Application Files table. For instructions, see **Find components installed with an application.**
# Tables installed

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifier [cmdb_identifier]</td>
<td>Identification rule sets defined for different classes of CIs.</td>
</tr>
<tr>
<td>Reconciliation Definition [cmdb_reconciliation_definition]</td>
<td>Reconciliation rules defined for different classes of CIs at the table and field level.</td>
</tr>
<tr>
<td>Identifier Entry [cmdb.identifier_entry]</td>
<td>Rule entries with different priorities assigned to each identifier.</td>
</tr>
<tr>
<td>Data Source Precedence [cmdb_datasource_precedence]</td>
<td>Priorities of data sources that are authorized to update the same CI types or CI type with same sets of attributes.</td>
</tr>
<tr>
<td>Duplicate Audit Result [duplicate_audit_result]</td>
<td>Duplicate audit results corresponding to a specific duplicate task. These results are generated automatically during the identification process and should not be added manually.</td>
</tr>
<tr>
<td>Remediate Duplicate Task [reconcile_duplicate_task]</td>
<td>Task to address duplication that is detected during the identification process. Records are generated automatically, and users should not add records manually.</td>
</tr>
<tr>
<td>Reclassification Task [reclassification_task]</td>
<td>Reclassification tasks that were generated during the identification process.</td>
</tr>
<tr>
<td>Data Source History [cmdb_datasource_last_update]</td>
<td>Information about the last data source that updated each attribute. Used to determine if a data source can update a stale CI.</td>
</tr>
<tr>
<td>Data Source Staleness Definition [cmdb_datasource_staleness]</td>
<td>Effective duration per data source. When effective duration is exceeded, then CMDB Health determines that the information provided by that data source is stale.</td>
</tr>
<tr>
<td>Identification Engine Context [cmdb_ie_context]</td>
<td>Input payload, and data source (cmdb_ci’s discovery_source) that will be used as input for a specific identification engine API. Also information about which specific identification engine API will be called (identifyCI or createOrUpdateCI API).</td>
</tr>
<tr>
<td>Identification Engine Run [cmdb_ie_run]</td>
<td>Specific cmdb_ie_context record that was used to run against the identification engine. Also details about the output payload returned by APIs, such as start and end time of the run and whether the run was successful.</td>
</tr>
<tr>
<td>Identification Engine Log [cmdb_ie_log]</td>
<td>Identification engine logs for a specific cmdb_ie_run run. Also details about logs level and order.</td>
</tr>
</tbody>
</table>
### Properties installed

Updating these properties requires users to have the admin role.

**Note:** To open the System Property [sys_properties] table, enter sys_properties.list in the navigation filter.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.required.attribute.enabled</td>
<td>Flag for enforcing required attributes during identification and reconciliation so that attributes cannot be null.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td></td>
<td>• Location: System Properties [sys_properties] table.</td>
</tr>
<tr>
<td>glide.class.upgrade.enabled</td>
<td>Flag for allowing class upgrade during identification and reconciliation.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td></td>
<td>• Location: System Properties [sys_properties] table.</td>
</tr>
<tr>
<td>glide.class.downgrade.enabled</td>
<td>Flag for allowing class downgrades during identification and reconciliation.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td></td>
<td>• Location: System Properties [sys_properties] table.</td>
</tr>
<tr>
<td>glide.class.switch.enabled</td>
<td>Flag for allowing class switching during identification and reconciliation.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td></td>
<td>• Location: System Properties [sys_properties] table.</td>
</tr>
<tr>
<td>glide.reconciliation.override.null</td>
<td>Flag for allowing the update of an empty field by a lower priority data source.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td></td>
<td>• Location: System Properties [sys_properties] table.</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>glide.identification_engine.skip_duplicates</td>
<td>Controls how identification processes a small set of duplicate CIs.</td>
</tr>
<tr>
<td></td>
<td>• When true: If the number of duplicate CIs is less than the threshold specified by glide.identification_engine.skip_duplicates.threshold, then the oldest of the duplicate CIs is picked as a match and gets updated. For the rest of the duplicate CIs, the CMDB_CIs’ discovery_source field is set to ‘Duplicate’.</td>
</tr>
<tr>
<td></td>
<td>• When false: Matching a CI fails, and an error is logged.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td></td>
<td>• Location: Add to the System Properties [sys_properties] table.</td>
</tr>
<tr>
<td>glide.identification_engine.skip_duplicates.threshold</td>
<td>The maximum number of CIs that can be in a set of duplicate CIs to allow identification to process the duplicate CIs according to the setting of glide.identification_engine.skip_duplicates.</td>
</tr>
<tr>
<td></td>
<td>If the number of duplicate CIs exceeds the threshold, then identification processes the duplicate CIs as if glide.identification_engine.skip_duplicates is set to false.</td>
</tr>
<tr>
<td></td>
<td>• Type: Integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 5</td>
</tr>
<tr>
<td></td>
<td>• Location: Add to the System Properties [sys_properties] table.</td>
</tr>
<tr>
<td>glide.cache.size.service_cache</td>
<td>The max cache size (in MB) that is used by the identification engine for inbound and outbound relations. When the limit is reached, the least recently used cached data is discarded, releasing space for new data.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> You cannot disable the service cache.</td>
</tr>
<tr>
<td></td>
<td>• Type: Integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 20</td>
</tr>
<tr>
<td></td>
<td>• Location: Add to the System Properties [sys_properties] table.</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| glide.identification_engine.distributed_locking       | By default, identification and reconciliation processes acquire a global lock. Enable this property to allow acquiring mutex lock faster, and at a more granular level. This lock optimization is mostly beneficial for scenarios with update operations rather than insert operations.  
  • Type: true | false  
  • Default value: false  
  • Location: System Properties [sys_properties] table. |
| glide.identification_logs.max_run_ids                 | Determines how many log runs can be displayed when navigating to Configuration Identification Logs.  
  • Type: integer  
  • Default value: 1000  
  • Location: System Properties [sys_properties] table. |
| glide.identification_engine.granular_insert_locking   | Determines whether to use multiple granular insert locks or single global insert lock. Set to false if there are performance issues associated with the usage of multiple granular insert locks.  
  • Type: true | false  
  • Default value: true  
  • Location: System Properties [sys_properties] table. |
| glide.identification_engine.batch_update_last_discovered | Controls batch update of last_discovered field in CIs that are being processed by the identification engine. Set to false if there are business rules that apply to last_discovered field, and you want to trigger these rules when calling Identification and Reconciliation API.  
  • Type: true | false  
  • Default value: true  
  • Location: System Properties [sys_properties] table. |
Examine identification engine run logs

Applications that use the identification engine (such as Discovery) can provide a URL to viewing identification engine run logs. To view results and for debugging purposes, you can use these links to examine the details of logs generated by the identification engine for payload runs.

Role required: admin

These URLs link to a central page where the identification engine payload output logs are displayed in a user friendly format. Logging is in the context of a specific run of the identification engine, and you can filter the log list by a specific data source and time range. The identification engine logging records are stored in the cmdb_ie_context, cmdb_ie_run, and cmdb_ie_log tables. Up to 1000 run logs that are up to 2 months old are displayed, grouped by Context IDs, and run times. You can use the glide.identification_logs.max_run_ids property to modify the 1000 limit.

You can control the logging level by using the glide.discovery.identification.log_level property and setting the value to one of the following:

- Info
- Warn
- Error
- Debug
- DebugVerbose
- DebugObnoxious

1. Navigate to Configuration Identification/Reconciliation Identification Logs.
2. Filter the runs list as follows:
   a) Source: Select the data source for which to display run logs.
   b) Time Range: Specify a time range for which to display run logs.

The Runs list displays all runs for the specified data source, during the specified time range.

3. In the Runs list, click a Run # to display its Context ID and Run ID.
A unique Context ID is associated with each specific payload that is run. Each run of that payload, is associated with a unique Run ID. A single Context ID for a payload that is run multiple times is associated with multiple Run IDs.

4. Click the drop down arrow for a Run # to display additional details.
   - Input: Displays the payload for the run.
   - Logs: Displays all the logged messages that the identification engine generated while running the payload, according to the specified logging level.
   - Output: Displays the output payload returned by the identification engine.

Identification engine error messages

The identification engine generates the following errors, which are displayed in the Identification Logging pane and in the system logs.

For information about lookup-based CI identification and qualifier chains, see Create or edit a CI identification rule on page 113.

**Note:** Discovery performs an initial verification of a payload before processing identification rules. If Discovery detects any duplicate CIs based on any class identifiers, the payload is rejected and processing stops.
<table>
<thead>
<tr>
<th>Error: IDENTIFICATION RULE MISSING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Message</strong></td>
</tr>
<tr>
<td>Identity Rule Missing for table [xyz]</td>
</tr>
</tbody>
</table>

**Description:** Identification rule is missing for a class.

**Resolution:** Ensure that there is an identification rule for table [xyz], and that the rule is active.

<table>
<thead>
<tr>
<th>Error: MISSING MATCHING ATTRIBUTES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Message</strong></td>
</tr>
<tr>
<td>In payload missing minimum set of input values for criterion (matching) attributes from identify rule for table [xyz]. Add these input values in payload item 'abc'</td>
</tr>
</tbody>
</table>

**Description:** Missing minimum set of values for criterion attributes for an identification rule.

**Resolution:** In the payload, add minimum set of values for criterion attributes for CI Identifier for table [xyz].

<table>
<thead>
<tr>
<th>Error: NO CLASS NAME FOR INDEPENDENT CI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Message</strong></td>
</tr>
<tr>
<td>Cannot have 'sys_class_name' as a key field in an Independent Identity Rule on 'xyz'</td>
</tr>
</tbody>
</table>

**Description:** The class attribute was added to the CI identifier which is not supported.

**Resolution:** Remove the class attribute from CI Identifier for table [xyz].
### Error: IDENTIFICATION RULE FOR LOOKUP MISSING

<table>
<thead>
<tr>
<th>Message</th>
<th>Description and Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identity Rule for table [xyz] missing Lookup Rule for class [abc]</td>
<td><strong>Description:</strong> The payload has a lookup class name, but the corresponding lookup rule is missing.</td>
</tr>
<tr>
<td></td>
<td><strong>Resolution:</strong> Add lookup identifier entry with [Search on table] as [abc] for CI Identifier for table [xyz].</td>
</tr>
</tbody>
</table>

### Error: IDENTIFICATION RULE FOR RELATED ITEM MISSING

<table>
<thead>
<tr>
<th>Message</th>
<th>Description and Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identity Rule for table [xyz] missing Related Rule for class [abc]</td>
<td><strong>Description:</strong> The payload has a related class name, but the corresponding related rule is missing.</td>
</tr>
<tr>
<td></td>
<td><strong>Resolution:</strong> Add related entry with [Related table] as [abc] within CI Identifier for table [xyz].</td>
</tr>
</tbody>
</table>

### Error: NO LOOKUP RULES FOR DEPENDENT CI

<table>
<thead>
<tr>
<th>Message</th>
<th>Description and Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cannot have Lookup Rule for a Dependent Identity Rule on ‘xyz’</td>
<td><strong>Description:</strong> Cannot have Lookup Rule for a Dependent Identity Rule.</td>
</tr>
<tr>
<td></td>
<td><strong>Resolution:</strong> Remove lookup identifier entry from dependent CI Identifier for table [xyz].</td>
</tr>
</tbody>
</table>
## Error: INVALID_INPUT_DATA

<table>
<thead>
<tr>
<th>Message</th>
<th>Description and Resolution</th>
</tr>
</thead>
</table>
| Found invalid sys_id in payload. No record with sys_id [xyz] exist in table [abc] or is a duplicate record with [discovery_source] field marked as Duplicate | **Description:** The payload has a reference to an invalid sys_id.  
**Resolution:** Remove the referenced sys_id, or provide a valid sys_id. |
| In payload no data source exist. You need to provide choice value from choice field [discovery_source] in table [cmdb_ci] | **Description:** In payload no data source exists.  
**Resolution:** In the payload, provide a valid choice value from choice field [discovery_source] from table [cmdb_ci]. |
| In payload invalid data source [xyz] exist. You need to provide a valid choice value from field [discovery_source] in table [cmdb_ci] | **Description:** The payload contains an invalid data source.  
**Resolution:** In the payload, provide a valid choice value from choice field [discovery_source] from table [cmdb_ci]. |
| No such relationship with name [xyz] exist in table [cmdb_rel_type]. If out-of-box relationship for [xyz] has been removed or renamed, it should be restored | **Description:** The payload is referencing a relationship that does not exist in the [cmdb_rel_type] table.  
**Resolution:** Verify that the reference to the relationship is accurate. Or, if it is a new relationship, add it to the [cmdb_rel_type] table. Or, if out-of-box relationship for [xyz] has been removed or renamed, restore it. |
| Payload relations 'xyz' has invalid parent record index: [0] | **Description:** Payload references invalid parent indexes.  
**Resolution:** Check payload indexes and ensure that they are all valid. |
| Payload relations 'xyz' has invalid child record index: [0] | **Description:** Payload references invalid child indexes.  
**Resolution:** Check payload indexes. |
### Error: DUPLICATE_RELATIONSHIP_TYPES

<table>
<thead>
<tr>
<th>Message</th>
<th>Description and Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duplicate relationship type records exists with name [xyz] in table [cmdb_rel_type] having sys_ids: [abc]</td>
<td>Description: There are duplicate records in the [rel_ci_type] table for the relationship.</td>
</tr>
<tr>
<td></td>
<td>Resolution: Remove the duplicate records.</td>
</tr>
</tbody>
</table>

### Error: DUPLICATE_PAYLOAD_RECORDS

<table>
<thead>
<tr>
<th>Message</th>
<th>Description and Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Found duplicate items in the payload (index 0 and 1), using className [xyz] and fields [abc]. Remove duplicate items from payload</td>
<td>Description: The payload contains two items whose criterion attributes have identical values.</td>
</tr>
<tr>
<td></td>
<td>Resolution: Remove one of the duplicate items.</td>
</tr>
</tbody>
</table>

### Error: LOCK_TIMEOUT

<table>
<thead>
<tr>
<th>Message</th>
<th>Description and Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failed to acquire synchronization lock for xyz</td>
<td>Description: Failed to acquire the system mutex lock.</td>
</tr>
<tr>
<td></td>
<td>Resolution: Increase the mutex expiration time by adding the system property glide.identification_engine.mutex_expiration_time and setting to an integer value that is greater than the default value (15 min).</td>
</tr>
</tbody>
</table>
**Error: MULTIPLE_DUPLICATE_RECORDS**

<table>
<thead>
<tr>
<th>Message</th>
<th>Description and Resolution</th>
</tr>
</thead>
</table>
| Found duplicate records in table [xyz] using fields [abc] | **Description:** Found duplicate records in the specified table.  
**Resolution:** Fix the duplicate records found by the identification engine. Check de-duplication tasks for information about all duplicates. |

**Error: REQUIRED_ATTRIBUTE_EMPTY**

<table>
<thead>
<tr>
<th>Message</th>
<th>Description and Resolution</th>
</tr>
</thead>
</table>
| Missing mandatory field [xyz] in table [abc]. Add input value for mandatory field in payload | **Description:** A required attribute is missing in the payload.  
**Resolution:** In the payload, add input value for mandatory field [xyz] in table [abc]. |

**Error: MISSING_DEPENDENCY**

<table>
<thead>
<tr>
<th>Message</th>
<th>Description and Resolution</th>
</tr>
</thead>
</table>
| In payload no relations defined for dependent class [xyz] that matches any containment/hosting rules: [abc]. Add appropriate relations in payload for 'def' | **Description:** No relations defined for the dependent class that matches any of its metadata rules.  
**Resolution:** In payload add appropriate relations for dependent class [xyz] that matches any containment/hosting rules: [abc]. |
**Error: METADATA RULE MISSING**

<table>
<thead>
<tr>
<th>Message</th>
<th>Description and Resolution</th>
</tr>
</thead>
</table>
| No containment or hosting rules defined for dependent class [xyz]. Add containment/hosting rules for 'abc' | **Description:** There are no containment or hosting rules defined for dependent class.  
**Resolution:** Add containment or hosting rules for dependent class [xyz]. |

**Error: MULTIPLE DEPENDENCIES**

<table>
<thead>
<tr>
<th>Message</th>
<th>Description and Resolution</th>
</tr>
</thead>
</table>
| Found multiple dependent relation items [xyz] and [abc] in payload | **Description:** Multiple dependent relation items exist.  
**Resolution:** Remove one of the multiple dependent relation items [xyz] or [abc]. |
| Multiple paths leading to the same destination: xyz -> abc | **Description:** Multiple paths leading to the same destination.  
**Resolution:** Remove duplicate relationship/qualifier chains that might exists between xyz -> abc. |
## Error: ABANDONED

<table>
<thead>
<tr>
<th>Message</th>
<th>Description and Resolution</th>
</tr>
</thead>
</table>
| Abandoning processing payload item 'xyz', since its depends on payload item 'abc' has errors | **Description:** Dependent payload item has errors, so放弃了 processing.  
**Resolution:** Resolve the error on the dependent payload item 'abc'. |
| Can't find matched record with sys_id [xyz] in table [abc] | **Description:** Matched sys_id does not exist in the corresponding table.  
**Resolution:** Check in table [abc] whether matched record is a valid record based on input payload. |
| Identification engine API got called recursively, aborting... | **Description:** The Identification engine API was called recursively.  
**Resolution:** Avoid calling the Identification engine API recursively. |
| Detected error while processing payload from xyz | **Description:** Error occurred during processing payload.  
**Resolution:** Resolve all errors mentioned in the output payload from xyz. |
| While processing relations encountered errors in payload item: xyz | **Description:** Payload item has errors.  
**Resolution:** Resolve errors in payload item 'xyz'. |
| Error occurred during parsing input json payload: xyz | **Description:** Error occurred during parsing JSON payload.  
**Resolution:** Ensure that input JSON payload has correct JSON format. |
### Error: MULTI MATCH

<table>
<thead>
<tr>
<th>Message</th>
<th>Description and Resolution</th>
</tr>
</thead>
</table>
| Duplicate dependent records found having relationship [xyz] with same CI (className: [abc], sysId:[def]) | **Description:** Found duplicate dependent CIs.  
**Resolution:** Check de-duplication tasks for information about all duplicates, and then delete duplicate records. |
| Found multiple relations between payload items: 'xyz' and 'abc' | **Description:** Found multiple relations between payload items.  
**Resolution:** Check for duplicate relationship chains and qualifier chains that might exist. |
| Found duplicate records in lookup table [xyz] using fields [abc] and reference field [def] | **Description:** Found duplicate records in lookup table.  
**Resolution:** Check de-duplication tasks for information about all duplicates, and then delete duplicate records. |

### Error: QUALIFICATION LOOP

<table>
<thead>
<tr>
<th>Message</th>
<th>Description and Resolution</th>
</tr>
</thead>
</table>
| Qualification chain has loop that contains relation 'xyz' | **Description:** Qualification chain has a loop.  
**Resolution:** Remove the loop from the qualification chain with relation 'xyz'. |
## Error: TYPE CONFLICT IN QUALIFICATION

<table>
<thead>
<tr>
<th>Message</th>
<th>Description and Resolution</th>
</tr>
</thead>
</table>
| Invalid payload, qualification chain has multiple possible paths for payload items: 'xyz' and 'abc' | **Description:** Multiple qualification paths found.  
**Resolution:** Remove multiple possible qualification paths between items ‘xyz’ and ‘abc’.

## Error: RECLASSIFICATION NOT ALLOWED

<table>
<thead>
<tr>
<th>Message</th>
<th>Description and Resolution</th>
</tr>
</thead>
</table>
| CI Reclassification not allowed from class: [xyz] to [abc] | **Description:** CI reclassification not allowed.  
**Resolution:** Check reclassification tasks for information about reclassification, and check if reclassification from class: [xyz] to [abc] is valid.

## Error: DUPLICATE RELATED PAYLOAD

<table>
<thead>
<tr>
<th>Message</th>
<th>Description and Resolution</th>
</tr>
</thead>
</table>
| Found duplicate Related items (0 and 1) in the payload index 1 using fields xyz | **Description:** Duplicate Related items present.  
**Resolution:** Remove one of the duplicate related items present in the payload.
CMDB Health

Monitoring and maintaining the health of the CMDB is essential to an effective and continuous use of the product. Health indicators such as duplicate CIs, required CI fields, and audits contribute to the calculation of health scorecards at the CI, class, and CMDB level.

The health of the CMDB data is monitored and reported for the following KPIs, each further consisting of sub metrics:

- Completeness: CIs are tested for required and recommended fields that are not populated.
- Correctness: CIs are tested against pre-defined data integrity rules such as identification rules, orphan CI rules, and stale CI rules.
- Compliance: The CMDB data is audited for adherence to pre-defined certificates.
- Relationships: The health of CI relationships is tested for indicators such as orphan and duplicate relationships. And for compliance with suggested relationships, hosting and containment rules.

After CIs are tested for various health indicators, the results are aggregated at the class level, and eventually at the overall CMDB level. You can configure how health is calculated and the weight of each KPI and each metric at every level of the aggregation. For most health tests, you can configure the health tests themselves.

CMDB Health is domain aware. If the domain separation plugin has been activated, then the CMDB dashboard displays health based on data, rules, and settings from the logged-on user domain. If rules and settings are not defined for a child domain, then the parent's settings are applied, recursively.

CI remediation

CMDB Health provides a framework for configuring CI remediation. Remediation lets you proactively apply corrective actions to unhealthy CIs in a managed and standardized fashion.

Setup

You need to configure CMDB Health related system properties, and health KPI and metric rules, to customize how aggregated data is calculated and other CMDB Health behavior. To start gathering and aggregating health data, you need to enable the CMDB Health-related jobs (CMDB Health Dashboard jobs) which are initially disabled. See Setup and configure CMDB Health on page 151 for details about enabling these jobs and about configuring other CMDB Health settings.
Domain separation in CMDB Health

This is an overview of domain separation as it pertains to CMDB Health. Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.

Overview

Domain separation is supported in this application. Not all ServiceNow applications support domain separation; some include limitations on the data and administrative settings that can be domain separated. To learn more, see Application support for domain separation.

CMDB dashboards should be set up with their own set of rules to best accommodate how the user needs them. CMDB dashboard jobs adhere to those rules to produce reports. These are covered in separate sections below.

How domain separation works in CMDB Health

For dashboards to be the most effective, users should configure the dashboard accordingly. This is done by setting up the orphan, staleness, and inclusion rules to meet their needs, and which then affect the reports displayed on the dashboard.

The settings and metrics define different aspects of each application because each domain can be configured differently. These rules are set up in addition to those that are included in the base system. There are different types of owners for different CIs; each domain has its own set of rules.

Note: Domain separation is on by default, but each domain can be configured as needed.

Health Preferences

Configure these preferences during setup:

1. Global system properties that control CMDB Health – System properties are not domain separated. To learn more see CMDB health system properties on page 152.

2. CMDB Health Dashboard Jobs – There is a dashboard job for each major KPI, such as Completeness. That job finds the health of the CIs across all the enabled domains. There is only one job run for all domains and jobs themselves are not domain separated. To learn more see Enable and configure a CMDB Health Dashboard job on page 153

   Users can define the frequency with which they want to run jobs; the report runs for all the domains. The more domains included in the job, the longer the job runs.

3. Health Metrics – These selections are domain-separated and adhere to the established “system overrides” logic of domain separation. Changes are made according to the domain for which the user is logged in. Base system values are defined at the global domain. The overriding domain logic means these values apply for all domains. If users want different values for a domain, they must be logged in to a specific domain and change the property from there. The new property setting applies only to that domain and any domain that inherits this domain. To learn more see Health Metrics.

   Note: Regarding the Completeness, Compliance, and Correctness KPIs: Users can disable this KPI if they don’t want to see that as part of the dashboard score. All these settings are domain-separated and the user can define specific properties for the domain.
a. Weighted averages – These settings can affect all or part of the metrics in Completeness, Compliance, Correctness, and Relationship. They can be set differently for different domains.

b. Active – This setting is the most important because it affects how long the jobs run. The more domains with flags set to Active, the longer the jobs take. It’s best to select only those domains you wish to be Active and render the rest Active = false. You can set this in Health Preferences. The default settings for global domain are set to Active = true, but you can modify or disable specific domains the user wants to see in the dashboard. Users should consider the domain hierarchy when changing these values. If there is a large number of domains (>100) the job can take a very long time. To mitigate this, set Active to False for all the root domains, thereby disabling all the other domains in the hierarchy. If there is a rule at the top, all child domains inherit that rule.

c. Failure Threshold, Create Task, Task Assignee Group – All these settings can be set differently for different domains depending on what is needed in each domain.

d. Exceptions – For Relationship metrics (relationship, duplicate relations, orphan relations, stale relations) the failure threshold setting is not domain separated. The Failure Threshold for the global domain is applied to all domains. For example, even if users were to override the Failure Threshold for a domain, the global domain setting for Threshold is still applied.

e. Troubleshooting / Implementation detail – These settings are stored in the cmdb_health_metric_pref table, which is domain separated.

**Health Rules**

Health rules settings are addressed here:

- **Required**
- **Recommended**
- **Orphan**
- **Staleness**

Most of the CMDB Health Rules are domain separated and provided by the users. Users can define different rules for different domains by logging in to each domain and adding/overriding rules in the CI Class Manager.

These are the rules for the different metrics:

1. Completeness
   a. Required fields – These are based on the class schema defined in the platform’s System dictionary and is fixed for all domains. These cannot be changed.
   b. Recommended fields – These are domain separated. The table used is cmdb_recommended_fields, which is domain separated. The user can set these up for different domains.

2. Correctness
   a. Duplicates – Duplicates are based on Identification rules, which are not domain separated, so the same rules apply to all domains.
   b. Orphan – Orphan rules are domain separated; there are different orphan rules for different domains. The table used is cmdb_health_orphan_rule and is domain separated.
3. Compliance
   a. Audit – Audit scores are based on the desired state or scripted audits defined in the compliance module by the user.
   Audits themselves are domain separated. When audit score evaluation is enabled for a domain, scores become based only on the audits visible in that domain.

   **Note:** Health Inclusion Rules are also domain separated. The table used is `cmdb_health_config`, which is domain separated.

### Health Dashboards (CMDB View/ Service View / Group View)

If a user is logged into a domain and views a health dashboard:

1. Only scores for enabled metrics in that domain display (based on the Health Preferences Active flag as discussed above).
2. All scores are based on CIs that are visible from the specific domain. (These are regular domain visibility rules: From that domain you can see CIs in global domain, the specific domain, any child domain of that domain or any domain that gets directly or indirectly contained by that domain.)
3. The dashboard view is based on domain rules defined in domain mapping, as opposed to those provided by the logged-in user. This view overrides any additional domain visibility rules that a logged-in user might have. The admin sets the basic rules, but does not set each individual domain. The admin can give specific users or user groups additional visibility to other domains and the dashboard still does not change. The dashboard strictly follows the domain rules mentioned above, based on the domain hierarchy for the domain in which the user is logged in.
4. As explained in the Health Preferences section, users can define different preference values for any domain which impact the scores reported in the dashboard. Preferences that can impact scores include Weighted Averages, Failure Threshold, and Active.
5. As explained in the CMDB Health Rules section, the scores reported for the metrics are based on the health rules defined for them (staleness, orphan, recommended, audit, and inclusion rules) which can be defined differently for a specific domain (in the CI Class Manager). Only the required metric and duplicate metric are based on rules that apply in all domains.
6. Service View/ Group View – These reports also largely follow the above points. Typically, these views differ from various views/filters for the Health Report. One is based off business rules, the other is based off CMDB Health groups.

### Setup and configure CMDB Health

The data collection system is highly configurable, however, the base system is minimally configured for aggregating CMDB health data. Most importantly, the CMDB Health Dashboard jobs are disabled by default and data is not collected. To display valuable and meaningful data, you should review and adjust settings.

1. Review *CMDB Health KPIs and metrics* on page 160 to learn what CMDB Health can monitor, and what needs to be configured to enable and support each metric.
2. For each KPI and associated metric that you want monitored, define the necessary rules and fulfill other needed requirements. For example, create orphan rules for detecting orphan records, if you are interested in this metric.

3. Review and adjust the threshold ranges for best, at risk, and critical states for the CMDB health metrics scorecards - see *Configure CMDB Health scorecard thresholds* on page 154.

4. Set metric aggregation preferences, deactivate KPI and metrics that you are not interested in reporting, set failure thresholds, and adjust weighted averages of aggregation - see *Configure KPI and metrics aggregation preferences* on page 156.

5. Narrow the scope of CIs that are included in health calculations - see *Create health inclusion rule* on page 159.

6. Enable the Health Dashboard jobs for the KPIs that you want reported - see *Enable and configure a CMDB Health Dashboard job* on page 153.

7. *Customize the CI dashboard* on page 170 (optional).

**CMDB health system properties**

Configure the following system properties to customize how CMDB health is monitored and evaluated.

Role required: itil_admin

**Note:** To open the System Property [sys_properties] table, enter sys_properties.list in the navigation filter.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max time in minutes for which individual metric processor will run in each scheduled cycle [glide.cmdb.health.metricProcessor.maxRunningTime]</td>
<td>If processing of a metric exceeds the specified time, CMDB health processing halts until the next CMDB health job is scheduled to run.</td>
</tr>
<tr>
<td></td>
<td>• Type: Numeric</td>
</tr>
<tr>
<td></td>
<td>• Default value: 120</td>
</tr>
<tr>
<td></td>
<td>• Location: Navigate to Configuration Health Preference. In the right hand-side navigator, click System Properties.</td>
</tr>
<tr>
<td></td>
<td>For performance reasons, it is recommended not to set this property to a value greater than 120.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> If you enter an invalid value, the default value is used.</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
</table>
| glide.cmdb.logger.use_syslog.CMDBHealth | A comma separated list that controls the level of logging of CMDB health jobs. Logging creates entries in the system logs to capture messages generated by the health auditing process each time they run. This helps debugging in case of failure. For example, to log error and info messages, set the value to 'error,info'.
| • Type: String | • Default value: error |
| | • Other possible values: Comma separated list with any of the following values: |
| | • info |
| | • error |
| | • warn |
| | Or '*' which is equivalent to including all possible values. |
| | • Location: System Property [sys_properties] table. |

Enable and configure a CMDB Health Dashboard job

Enable and configure the jobs that process CMDB health tests, to start calculating CMDB health scores for the completeness, compliance, correctness, and relationship KPI. These health scores are then aggregated into the overall CMDB health report.

Role required: admin

In the base system, CMDB Health Dashboard jobs are disabled by default. Enable and configure the respective job for the CMDB health KPI that you want data collected and aggregated for. You can schedule a job to run on a recurring schedule, or execute it once at any time.

1. Navigate to Configuration CMDB Dashboard CMDB View, and then click CMDB Health Dashboard Jobs.
2. Select a job that you want to enable or configure.

<table>
<thead>
<tr>
<th>CMDB Health Dashboard job</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMDB Health Dashboard - Completeness Score Calculation</td>
<td>Script for calculating the completeness KPI of CMDB health.</td>
</tr>
<tr>
<td>CMDB Health Dashboard - Compliance Score Calculation</td>
<td>Script for calculating the compliance KPI of CMDB health.</td>
</tr>
<tr>
<td>CMDB Health Dashboard - Correctness Score Calculation</td>
<td>Script for calculating the correctness KPI of CMDB health.</td>
</tr>
<tr>
<td>CMDB Health Dashboard - Relationship Score Calculation</td>
<td>Script for calculating the CI relationships KPI of CMDB health.</td>
</tr>
</tbody>
</table>
3. Review the default configuration, and update as necessary.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Job name. It is recommended that you do not modify the job’s name.</td>
</tr>
<tr>
<td>Active</td>
<td>Select to activate the job.</td>
</tr>
<tr>
<td>Run</td>
<td>Configure recurring schedule of job execution, or select On Demand.</td>
</tr>
<tr>
<td>Time</td>
<td>If Active is selected, set the time (hour, minute, and second) to run the job.</td>
</tr>
<tr>
<td>Conditional</td>
<td>If selected, the scripted condition must evaluate to true before the job can run.</td>
</tr>
<tr>
<td>Run this script</td>
<td>The job’s script. Modifications to the script are not recommended.</td>
</tr>
</tbody>
</table>

4. Click Execute Now to run the job once immediately.

After you enable a CMDB Health Dashboard job, the results for the KPI are aggregated and displayed in the CMDB dashboard and CI dashboard, at the CMDB, class, and CI levels.

Configure CMDB Health scorecard thresholds

Configure the thresholds for best, at risk, and critical state definitions for the KPIs and metrics scorecards. You can configure these settings globally for the entire CMDB, or individually per class.

Role required: itil has read access, itil_admin (on top of itil) has full access.

Scorecard thresholds are used to determine overall metric state, and are defined by upper and lower thresholds. For example, scorecards thresholds for completeness:

- 0 - lower threshold: Best state
- Lower threshold - upper threshold: At risk state
- Upper threshold - 100: Critical state

In the base system, upper thresholds are set to 67 and lower thresholds are set to 33 for all KPIs and metrics. You can adjust scorecard thresholds to reflect the range of failures that should be used for each health state. Applying the change to a scorecard is based on the selected class in the CI Classes list:

- If the top level Configuration Item class is selected in the CI Classes list, changes to metric scorecards apply to the entire hierarchy.
- If any other class is selected in the CI Classes list, changes to metric scorecards apply to the selected class.

For CMDB groups, you can specify a separate set of scorecard thresholds, per CMDB group/KPI or metric. See Configure CMDB groups scorecard thresholds on page 155 for more details.

1. Navigate to Configuration CI Class Manager.
2. Click Hierarchy to display the CI Classes list, and then select a class to set scorecards for.
3. In the class navigation bar, expand Health.
4. To configure the overall scorecard, select Other Scorecards and then select Overall Scorecard.
5. To configure a scorecard for any of the KPIs (such as Compliance), or for relationship-related metrics (such as duplicate relations):
   a) Select configuration item at the top of the Hierarchy list.
   b) Click a KPI item, Completeness, Compliance, or Correctness.
   c) Click the tab CMDB Completeness Scorecard, CMDB Compliance Scorecard, or CMDB Correctness Scorecard.

When you select the top-level Configuration Item class, changes to threshold settings in any metric scorecard apply to the entire class hierarchy.

6. To configure a scorecard for any metric:
   a) In the CI Classes list, select the class to which the updated scorecard should apply to. Select the top level Configuration Item to apply the change to the entire hierarchy.
   b) Click the KPI that contains the metric for which you want to configure scorecard. For example, click Completeness to configure the Required Fields scorecard.
   c) Select the scorecard tab of the metric to configure, such as Required Fields Scorecard. You might need to click New to edit the scorecards.

7. Slide the threshold sliders, or enter specific numbers to increase or to decrease the threshold bars to fit your definitions for best, at risk, and critical levels for the scorecard.
8. Click Save.

Configure CMDB groups scorecard thresholds

Each CMDB group can have its unique set of scorecard thresholds for best, at risk, and critical state definitions for specific KPIs or metrics.

Role required: itil_admin (on top of itil)

Scorecard thresholds are used to determine overall metric state, and are defined by upper and lower thresholds:

- 0 - lower threshold: Best state
- Lower threshold - upper threshold: At risk state
- Upper threshold - 100: Critical state

In the base system, for all KPIs and metrics, upper thresholds are set to 67 and lower thresholds are set to 33. You can adjust scorecard thresholds for a specific CMDB group per KPI or metric, to reflect the range of failures that should be used in health reporting.

CMDB groups scorecard thresholds are stored in the [cmdb_health_scorecard_group_threshold] table.

1. In the search box in the navigation bar, enter cmdb_health_scorecard_group_threshold.list and press the Enter key.
2. In the CMDB Health Group Scorecard Thresholds list, click New.
3. Fill out the form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper threshold</td>
<td>Upper range of percentage of CIs failing the specified metric tests, that is used to calculate best and at risk states.</td>
</tr>
</tbody>
</table>
Configure KPI and metrics aggregation preferences

Metrics health scorecards are aggregated into their respective KPI, which in return are aggregated into the overall CMDB Health report. Set aggregation preferences for KPIs, and for each of their respective metrics, deactivate KPIs and metrics that you are not interested in reporting, and adjust weighted averages of aggregation.

To start collecting and reporting CMDB health KPIs and metrics, you must first enable and configure the CMDB health dashboard jobs.

Role required: itil_admin (on top of itil)

The completeness KPI for example, consists of the metrics required fields and recommended fields, each contributing a different weight to the sum. You can configure the proportional weight of required fields and recommended fields within completeness to be 25 and 75 respectively. You can also configure the proportional weight of completeness, compliance and correctness within the aggregated sum of the overall CMDB health.

**Note:** Non-active KPI or metrics are displayed on the CMDB dashboard in faded coloring, displaying the most recent aggregations that were calculated when the KPI or metric was active.

If Domain Support - Domain Extensions is activated, then you can configure aggregation preferences per domain.

In the ServiceNow base system, the weights of KPIs have default settings, and metrics are globally set.

1. Navigate to Configuration Health Preferences.
2. Select Health Metrics on the right-hand side navigator.
3. From the Select Metric list select one of the KPIs such as Completeness, or a metric.
   For Completeness, Compliance and Correctness:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>Activate the KPI so it is included in the aggregated CMDB health report.</td>
</tr>
<tr>
<td>Weighted Averages</td>
<td>Specify the weight of each metric in the aggregated KPI health report. The sum of weighted averages of all metrics should be 100.</td>
</tr>
</tbody>
</table>

For a metric:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMDB Group</td>
<td>The CMDB group to which this scorecard threshold setting applies to.</td>
</tr>
<tr>
<td>Lower threshold</td>
<td>Lower range of percentage of CIs failing the specified metric tests, that is used to calculate at risk and critical states.</td>
</tr>
<tr>
<td>Metric</td>
<td>The metric to which the scorecard threshold setting applies to.</td>
</tr>
</tbody>
</table>

4. Click Submit.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>Activate the metric so it is included in the aggregated health report for the respective KPI.</td>
</tr>
<tr>
<td>Create Task</td>
<td>If a record fails the metric test, create a task with details about the failure. You can then view the task on the CI dashboard, and configure remediation for the task.</td>
</tr>
<tr>
<td>Failure Threshold</td>
<td>When the threshold number of CIs that fail the health metric test is reached, health processing stops for the metric for this cycle.</td>
</tr>
<tr>
<td>Task Assignee Group</td>
<td>An assignment group for the task.</td>
</tr>
</tbody>
</table>

4. Click Save.

**Set a CI attribute to be mandatory**

Configure a CI attribute as mandatory so it is included in the CMDB Health tests for the required metric if enabled. Required is a metric of the CMDB Health completeness KPI.

Role required: itil_admin

When a field is configured as mandatory, then if the required metric is enabled, the CMDB health tests check whether that field is populated or not. The CMDB dashboard displays the aggregated report of the percentage of CIs for which one or more required fields is empty.

1. Navigate to Configuration CI Class Manager.
2. Click Hierarchy to display the CI Classes list. Then select the class with the field that needs to be set as mandatory.
3. In the class navigation bar, expand Class Info and then select Attributes. In the Attributes view, click Added.
4. Locate the attribute that you want to set as mandatory, and then double-click its Mandatory value and set it to true.

The next time the form is opened, a field status indicator appears next to the field label, indicating that a value is mandatory.

**Note:** Mandatory fields are global. The field is marked as mandatory everywhere it appears on a form.

**Set a CI field to be recommended**

Define a list of CI fields as recommended, noting that it is desirable that they are populated by a data source such as Discovery. You can then configure the CMDB completeness KPI to include recommended fields in its aggregated health reports.

Role required: itil has read access, itil_admin (on top of itil) has full access.

Use this for fields which should not be mandatory, but that might have useful information that the CI should have. For example, a field with information that might at some point help with diagnosis. All classes derive the recommended fields that are defined at the parent level. You can remove any of these derived recommended fields for a CI, without affecting the parent CI or sibling CIs.
For more information about child and parent classes, see *Table extension and classes*.

1. Navigate to **Configuration CI Class Manager**.
2. Click **Hierarchy** to display the CI Classes list. Then select the class that contains the fields that need to be set as recommended.
3. In the class navigation bar, expand **Health** and click **Completeness**. Then click **Recommended Fields**.
4. In the **Recommended Fields** tab, use the slushbucket to move the fields that you want to designate as recommended, from the **Available** list to the **Selected** list.
5. Click **Save**.

**Create or edit a CMDB Health orphan rule**

Create an orphan rule to determine the percentage of orphan CIs in the CMDB. This sum is then aggregated into the correctness CMDB Health KPI, and weighed into the overall CMDB health report. Orphan rules are defined per class, and only a single orphan rule can be defined per class.

Role required: itil has read access, itil_admin (on top of itil) has full access.

In order for a CI to be considered an orphan CI, specify attributes that a CI must have, relationships that a CI should not have, or both. In the relationship conditions, you can either specify that the CI has no relationships, or a set of specific relationships that the CI does not have. An orphan rule can for example define that if a CI doesn’t have an owner or an asset, then it is considered an orphan CI.

1. Navigate to **Configuration CI Class Manager**.
2. Click **Hierarchy** to display the CI Classes list. Select the class for which to create an orphan rule.
3. In the class navigation bar, expand **Health**. Click **Correctness** and then click **Orphan Rule**.
4. Select a rule to edit if one exists, or click **New**. Fill out the form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class</td>
<td>The class for which the orphan rule applies.</td>
</tr>
<tr>
<td>Attributes</td>
<td>Attribute conditions that a CI must satisfy to be considered an orphan CI. For example, the filter conditions in which both the Assigned to and the Owned by fields are empty, will identify the matching CIs as orphans.</td>
</tr>
<tr>
<td>Condition</td>
<td>And/Or operation between the Attributes conditions and the Relationship conditions.</td>
</tr>
<tr>
<td>Relationship</td>
<td>The relationship conditions that a CI must fail in order to be considered an orphan CI. To specify that a CI must have no relationships, choose Any Relation and Any Class respectively.</td>
</tr>
</tbody>
</table>

5. Click **Submit** or **Update** to save the rule.

**Create or edit a CMDB Health staleness rule**

If the staleness metric is in effect, then staleness rules are used to determine the percentage of stale CIs in the CMDB. This sum is then aggregated into the correctness KPI, and weighs into the overall CMDB health calculation. Staleness rules are defined per class.
Role required: itil has read access, itil_admin (on top of itil) has full access.

The Discovery setting of certain types of CIs as stale takes precedence over a CMDB Health staleness rule defined for the CI. For more information about Discovery marking CIs as stale, see *Discovery for VMware vCenter*.

1. Navigate to Configuration CI Class Manager.
2. Click Hierarchy to display the CI Classes list. Select the class for which to create a staleness rule.
3. In the class navigation bar, expand Health and then click Correctness. Click Staleness Rule.
4. Select a staleness rule to edit or click New, and then fill out the Staleness Rule form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applies to</td>
<td>The class for which the rule applies.</td>
</tr>
<tr>
<td>Effective Duration</td>
<td>The time period that is used for the staleness test. If the CI was not updated (based on Updated sys_updated_on) within the specified time period — the CI is determined to be stale. If you enter a value with a prefix that is valid and a suffix that is not, such as 15 x — the valid portion of the value is used ('15'). If the entire value is invalid — the value is ignored and the previous valid value is used.</td>
</tr>
</tbody>
</table>

5. Click Submit or Update to save the rule.

Prepare a scripted audit for the compliance KPI

To include a scripted audit in CMDB Health compliance calculations, you need to update the audit's script so it captures the time that the audit ran last.

Role required: certification_admin

CMDB Health uses audits' Last run date to collect the results from the most recent complete audit run. These results are then aggregated into the CMDB Health compliance KPI. When scripted audits run, they do not register the runtime. Therefore, to include scripted audits in the compliance KPI health aggregation, you must update the audit script so it populates the Last run date field.

1. *Create or edit a scripted audit.*
2. On the Audit form, update the script in Run this script. Add the following code at the top of the script, just before the code that filters CIs:
   ```java
   new SNC.CertificationProcessing().updateLastRunDate(current.sys_id);
   ```

Create health inclusion rule

You can narrow the scope of CIs that are included in health calculations by defining health inclusion rules. Health inclusion rules can be specified per domain.

Role required: itil has read access, itil_admin (on top of itil) has full access.

Evaluation for the required, orphan, recommended, and staleness health metrics, will apply only to CIs that satisfy health inclusion rules. For the duplicate metric, *Identification inclusion rules* can be used for that purpose.
In the base system, there are no predefined health inclusion rules, in which case all CIs are included in the CMDB Health calculations.

1. Navigate to Configuration CI Class Manager.
2. Click Hierarchy to display the CI Classes list. Select the class for which to create a health inclusion rule.
3. In the class navigation bar, expand Health and then click Health Inclusion Rules.
4. Click an existing rule to edit or click New and then fill out the Health Inclusion Rules form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applies to</td>
<td>Class this rules applies to.</td>
</tr>
<tr>
<td>Active record condition</td>
<td>Criteria that CIs must meet to be included in the evaluation for the specified health metrics.</td>
</tr>
<tr>
<td>Applies to metric</td>
<td>Metrics that the rule applies to.</td>
</tr>
</tbody>
</table>

5. Click Save or Update.

CMDB Health KPIs and metrics

The overall CMDB health score consists of three Key Performance Indicators (KPIs) which are correctness, compliance and completeness, each further consisting of sub-metrics. Each KPI and metric is associated with a scorecard that determines its contribution to the aggregated health at the overall CMDB level, class, and CI level.

You can configure which KPIs and metrics are included in the aggregated calculation, and set their weight in the aggregation. In the base system, all KPIs and all metrics are included in the aggregated health report.

**Overall**

An aggregation of all three KPIs (correctness, completeness and compliance), according to their overall scorecard weight settings.

**Correctness**

A KPI which is an aggregation of the following metrics, according to the correctness scorecard weight settings.

**Orphan**

Measures the percentage of orphan CIs in the CMDB. A CI can become orphan if it was unintentionally left in the CMDB when it is no longer needed. A CI is determined to be orphan if:

- The CI satisfies the criteria in an **orphan rule**. This criteria checks for specific attributes that a CI must have, and for CIs that have no relationships or that don't have specific relationships.
- Data is missing for the CI in its respective table, or in one of its parents' table.
Staleness

Measures the percentage of stale CIs in the CMDB. A CI is stale if it was not updated within the Effective Duration time period that is specified in the *staleness rule* that applies to the class.

The base system includes a default staleness rule for the Configuration Item [cmdb_ci] class, which sets the Effective Duration time to 60 days. This rule applies to all extended CMDB classes, and can be overridden by class specific staleness rules defined by the user. To determine CI staleness, a staleness rule for the CI's class is used if it exists, otherwise, the default staleness rule is used.

In addition, a relationship in which a stale CI is a parent or a child, is determined to be a stale relationship.

Note: Discovery marks VMware vCenter CIs that no longer physically exist, as stale. This setting takes precedence over a CMDB Health staleness rule defined for the CI. When drilling-down in the CMDB dashboard to Health Results, the Source for these CIs is CLOUD_DISCOVERY. For more information, see *Discovery for VMware vCenter*.

Duplicate

Measures the percentage of duplicate CIs in the CMDB using identification rules. Only independent CIs are evaluated for duplication. In a set of duplicate CIs, the count of duplicate CIs is the total number of CIs in the set, minus one. The detailed graphs for a duplicate set of CIs display all the CIs in the set.

Completeness

A KPI which is an aggregation of the following metrics, according to the completeness scorecard weight settings.

**Required**

Measures the percentage of CIs in which fields that are defined as mandatory, are not populated. Missing fields are tagged as incomplete noting that for this CI some information is missing. Required fields are equivalent to the fields that are *specified as mandatory* in the system dictionary.

**Recommended**

Measures the percentage of CIs in which fields that are *set as recommended*, are not populated. Out-of-box, no recommended fields are specified.
Compliance

Based on the results of actual CMDB audit runs.

Audit

Audit compares actual values of specified fields, against expected values defined in template and scripted audits. Based on the Last run date of audits, CMDB Health identifies the set of the most recent complete audit run, and uses those audit results. To pass the CMDB Health audit test, a CI must be in compliance with all audits for that CI. Create a compliance-type audit, for which the results are calculated into the CMDB Health compliance KPI.

When running scripted audits, the Last run date is not populated. Therefore, for the compliance KPI to include the results of a scripted audit, update the script in the audit to record the audit run time.

For more information, see Create an audit.

Relationships

Measures the health of CI relationships, consisting of the following metrics which are not-configurable:

Duplicate relationships

Relationships that have identical parent and child CIs, identical relationship type, and an identical port. Duplicate relationships are displayed per relationship type. In a set of duplicate relationships, the duplicate relationship count is the total number of duplicate relationships in the set, minus one. The detailed graphs for a duplicate set of relationships display all the relationships in the set.

Orphan relationships

A relationship that is missing either a parent CI, a child CI, or both.

Stale relationships

A relationship in which the parent CI or the child CI is a stale CI.

A single relationship can fail more than one health test. For example, a duplicate relationship can also be stale.

Also reports the following relationship-related summaries:

- Relations not compliant with suggested relations
- Relations not compliant with containment rules
- Relations not compliant with hosting rules

CMDB Health dashboards

CMDB dashboards display CMDB health reports and let you configure the CMDB health KPIs and metrics that CIs are evaluated for.
<table>
<thead>
<tr>
<th>Dashboard</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMDB Dashboard</td>
<td>Main CMDB health dashboard:</td>
</tr>
</tbody>
</table>
| Configuration CMDB Dashboard CMDB View | - Overall CMDB and class level aggregated CI health. Aggregation is displayed from the metric level up to the overall CMDB level.  
- Aggregated health for CI relationships, and its metrics.  
- Displays the tasks that were generated for CIs that failed a health test.  
- Drill down for each KPI to a detailed report of associated metrics, broken by class.  
- Manage the CMDB Health Dashboard jobs. |
| CI Dashboard                     | Health reports at the CI level:                                     |
| <CI form> Dashboard              | - Pass/fail results for each metric, per CI.  
- Displays incidents, changes, and other tasks affecting the CI, and business services affected by the CI. |
| CI Class Manager                 | Central location to manage CI classes and to configure CMDB health settings: |
| Configuration CI Class Manager   | - Configure scorecard thresholds of all KPIs and associated metrics.  
- Configure weight of KPIs and associated metrics in health aggregation.  
- Manage rules and definitions that are used for health tests, such as orphan rules, audit certificates, and recommended fields rule.  
- Explore the class hierarchy.  
- Update and extend a CI class.  
- Delete all records for a class. |
| CMDB Health Preferences          | Central location for configuring CMDB Health settings:               |
| Configuration Health Preferences | - Configure CMDB Health preferences.  
- Manage the CMDB Health Dashboard jobs.  
- Activate and configure weighted averages for KPIs and metrics.  
- Set the maximum failure threshold for the KPIs.  
- Configure creation of tasks for failed CIs. |
### Dashboard | Use
--- | ---
CMDB Service Dashboard | Main CMDB service health dashboard:
- Overall service aggregated health and detailed health for CIs per service. Aggregation is displayed from the metric level up to the overall services level.
- Displays the tasks that were generated for CIs in a service that failed a health test.
- Drill down for each KPI to a detailed report of associated metrics, broken by class.
- Manage the CMDB Health Dashboard jobs.

Configuration CMDB Dashboard Service View

CMDB Group View Dashboard | Main CMDB groups (whose type is Health) dashboard:
- Overall CMDB health groups aggregated health and detailed health for CIs in the group. Aggregation is displayed from the CI level up to the overall group level.
- Drill down for each KPI to a detailed report of associated metrics, broken by class.
- Manage the CMDB Health Dashboard jobs.

Configuration CMDB Dashboard Group View

---

View CMDB health reports

The CMDB dashboard serves as a central location to view aggregated health reports for your CMDB at a glance which helps you understand the CMDB health status. Also, it provides functions to address health issues, and improve CMDB health.

The CMDB dashboard requires some configuration before it can display meaningful data. Once CMDB Health is configured and the CMDB Health Dashboard Jobs are enabled, the dashboard displays data that is automatically collected and calculated on a recurring schedule. The CMDB dashboard uses the Performance Analytics framework for dashboards and employs some of the capabilities it provides. The CMDB dashboard is domain aware.

Using the CMDB dashboard requires the asset or itil role, and if the system property glide.cms.enable.responsive_grid_layout exists, then its value must be true. For more information, see Enable responsive dashboards.

For information about sharing a responsive dashboard (Sharing), see Share a responsive dashboard.

**Note:** Only users with the itil role can view a CMDB dashboard which has been shared.

Access the CMDB dashboard by navigating to Configuration CMDB Dashboard CMDB View. On the CMDB dashboard:

- Click CMDB Health Dashboard Jobs to enable and manage the jobs that monitor and collect health data for CIs and CI relationships.
- Click the default CMDB Dashboard - CMDB View dashboard to list additional CMDB drill-in dashboards.

The CMDB dashboard has two viewing modes. Click CI Health or Relationship Health to toggle between them.
CMDB Health view

The CMDB Health view is the default view for the CMDB dashboard. It contains scorecards detailing the overall health of CIs in your CMDB, per health KPI and metric. Also, it contains useful reports showing a breakdown of any duplicate, orphan or stale CIs by class, and lists the top 10 incident, alert, and change generating CIs in the CMDB.

All the default widgets in the CI Class view can be filtered using the CMDB class hierarchy tree. Initially, the class hierarchy filter is set to the root class, Configuration Item (All). Click All to select a different class, filtering all widgets on the dashboard to display data only for the selected class and its child classes.

In each scorecard widget, the horizontal bar in the center and the % number are correlated, displaying the aggregated health summary for the KPI. Health results of associated metrics are displayed underneath, each contributing according to the configuration of the metric scorecard, and its threshold.

Except for the Overall health scorecard, you can drill into any widget in the CI Class view:

- In a scorecard widget: Click the large aggregated percent number or the health bar to drill into a more detailed dashboard for that KPI.
- In a charts widget: Click a bar to display a list of all the records that the bar represents.
- In lists: Click the ‘i’ icon to view a list of all the tasks or alerts related to the CI.

Relationship Health view

The Relationship Health view displays various scorecards for health indicators of CI relationships in your CMDB. It contains charts detailing any duplicate, orphan or stale relationships, broken down by relationship type. You can drill down these charts for further details.

Changing the CI Class selection while in the Relationship view has no effect on the data displayed in this view.

Color codes

Both, the CI class view and the relationship view, use color codes when displaying aggregated health status. The status definitions are based on each scorecard’s threshold limits that are defined in the CI Class Manager.

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Best</td>
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<td>Orange</td>
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<td>More than 33 and less than or equal to 67</td>
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<tr>
<td>Red</td>
<td>Critical</td>
<td>More than 67</td>
</tr>
<tr>
<td>Gray</td>
<td>Incomplete</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Note: The icon is a notation that the maximum failure threshold for the scorecard has been reached. The tests for the metric are halted for this cycle, and all associated aggregated summaries are 0%. Review the scorecard rules which might be ineffective, or the CMDB might be in an unstable state.
Dashboard layout configuration

The CMDB dashboard uses some of the capabilities that Performance Analytics provides for responsive dashboards. You can, for example, add or remove widgets from the layout.

For information about adding a widget (Add Widgets) and changing other layout settings such as adding a tab (Create Tab) to the dashboard; see *Edit a responsive dashboard*. The drop-down that appears when adding a widget, includes CMDB-related widgets that are used in CMDB dashboards and other system widgets which are typically not relevant in CMDB reports.

Domain separation

If the Domain Support — Domain Extensions Installer plugin is activated, then the CMDB dashboard is domain aware:

- The CMDB dashboard aggregates and reports health failures and scores based on user’s domain visibility of CIs. If domain visibility lets a user see a CI, then the audit rule in that user’s domain applies to that CI, whether the CI is in the user’s domain or in a contained domain. If a CI fails health tests from different user domains, then separate failure records are created.
- Users can configure KPI and metric settings specific to the needs in their domain. So different domains can have different settings such as active/inactive, and thresholds.
- A child domain derives its immediate parent’s domain health configurations if the child domain does not configure its own. A child domain can override parent’s configurations by modifying them.

View services health reports

The CMDB service dashboard serves as a central location to view aggregated health reports for services at a glance. Also, it lets you drill into a service to perform remediation actions that address health issues, and that improve CMDB health. The CMDB service dashboard uses the Performance Analytics framework for dashboards and employs the capabilities it provides.

Requirements

- The Event Management and Service Mapping Core plugin must be activated.
- If the system property glide.cms.enable.responsive_grid_layout exists, then it needs to be set to true. For more information, see *Enable responsive dashboards*.
- Role required: asset or itil

Configuration

The CMDB service dashboard requires some configuration before it can display meaningful data, using the same settings as the CMDB dashboard. The CMDB service dashboard uses the settings for the Business Service, Manual Service, and Technical Service classes. For each CI that is included in a service, the rule settings of its respective class are applied. You can customize these settings in the CI Class Manager, and on the CMDB Health Preferences page. Once CMDB Health is configured and the CMDB Health Dashboard Jobs are enabled, the CMDB service dashboard displays data that is automatically collected and calculated on a recurring schedule.

CMDB Health is domain aware. If domain separation has been activated, then the CMDB service dashboard displays health based on data, rules, and settings from the logged-on user domain. If rules and settings are not defined for a child domain, then the parent’s settings are applied, recursively.
Access

Access the CMDB service dashboard by navigating to Configuration CMDB Dashboard Service View.

Report details

The CMDB service dashboard displays aggregated health for services, and also details for individual services. For a specific service, the CMDB service dashboard displays aggregated health for all the CIs in that service, including the service CI itself. Also it provides useful reports about service classes such as the Business Service class. You can drill down those reports to display further details of duplicate, orphan, or stale CIs per service and lists of the top 10 incident, alert, and change generating CIs in the service.

All default widgets can be filtered using the CMDB service hierarchy tree. Initially, the service hierarchy filter is set to Business Service. Click Business Service to expand it and to select a different class, filtering all widgets on the dashboard to display data only for the selected class, its child classes, or services of that class.

In each scorecard widget, the horizontal bar in the center and the % number are correlated, displaying the aggregated health summary for the KPI. Health results of associated metrics are displayed underneath, each contributing according to the weight configuration of the metric scorecard, and its threshold.

With the exception of the Overall health scorecard, you can drill into any widget in the service dashboard:

- In a scorecard widget: Click the large aggregated percent number or the health bar to drill into a more detailed dashboard for that KPI.
- In a charts widget: Click a bar to display a list of all the records that the bar represents.
- In lists: Click the 'i' icon to view a list of all the tasks or alerts related to the CI.

Color codes

The CMDB service dashboard uses color codes when displaying aggregated health status. The status definitions are based on the threshold limits for each scorecard, defined in the CI Class Manager.

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The icon is a notation that the maximum failure threshold for the scorecard has been reached. The tests for the metric are halted for this cycle, and all associated aggregated summaries display 0%.

View CMDB groups health reports

The CMDB group view dashboard serves as a central location to view aggregated health reports for CMDB groups at a glance. Also, it lets you drill into a CMDB group to perform remediation actions that address
health issues, and that improve CMDB health. The CMDB group view dashboard uses the Performance Analytics framework for dashboards and employs the capabilities it provides.

**Configuration**

The CMDB group view dashboard requires some configuration before it can display meaningful data, using the same settings as the CMDB dashboard. For each CI that is included in a CMDB group, the rule settings of its respective class are applied. You can customize these settings in the CI Class Manager, and on the CMDB Health Preferences page. Once CMDB Health is configured and the CMDB Health Dashboard Jobs are enabled, the CMDB group view dashboard displays data that is automatically collected and calculated on a recurring schedule.

If the system property glide.cms.enable.responsive_grid_layout exists, then it needs to be set to true. For more information, see [Enable responsive dashboards](#).

CMDB Health is domain aware. If domain separation has been activated, then the CMDB group view dashboard displays health based on data, rules, and settings from the logged-on user domain. If rules and settings are not defined for a child domain, then the parent’s settings are applied, recursively.

Role required: asset or itil

**Access**

Access the CMDB group view dashboard by navigating to Configuration CMDB Dashboard Group View. Then, select a CMDB group from the CMDB Health Group List drop-down list.

**Report details**

For each CMDB group, the CMDB group view dashboard displays aggregated health for all the CIs in that group. You can drill down those reports to display further details of duplicate, orphan, or stale CIs per CMDB group. In each scorecard widget, the horizontal bar in the center and the % number are correlated, displaying the aggregated health summary for the KPI. Health results of associated metrics are displayed underneath, each contributing according to the weight configuration of the metric scorecard, and its threshold.

With the exception of the Overall health scorecard, you can drill into any widget in the CMDB group view dashboard:

- In a scorecard widget: Click the large aggregated percent number or the health bar to drill into a more detailed dashboard for that KPI.
- In a chart widget: Click a bar to display a list of all the records that the bar represents.
- In lists: Click the ‘i’ icon to view a list of all the tasks or alerts related to the CI.

**Color codes**

The CMDB group view dashboard uses color codes when displaying aggregated health status. The status definitions are based on the threshold limits for each scorecard, defined in the CI Class Manager.

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The ![](image) icon is a notation that the maximum failure threshold for the scorecard has been reached. The tests for the metric are halted for this cycle, and all associated aggregated summaries display 0%.

**View CI health**

The CI dashboard is a central location displaying health report for an individual CI, history of changes to the CI in a timeline view, and the relation formatter. The CI dashboard also displays incidents, changes, and other tasks affecting the CI, and business services affected by the CI. You can access the CI dashboard from a CI form, or from the CMDB dashboard.

Role required: asset or itil

The health scores are based on settings of CMDB Health KPIs and metrics. The report is calculated in real-time from data stored in health-related tables which the CMDB Dashboard jobs update on a recurring schedule. The completeness and correctness KPIs are always up to date, but for other KPIs, it is possible that updates to the CMDB are not reflected because one of the dashboard jobs hasn’t run yet, as follows:

- Compliance: Depends on audit cycles and on the ‘CMDB Health Dashboard - Compliance Score Calculation’ job.

To ensure that the latest updates to these KPIs are reflected on the CI dashboard, navigate to the respective dashboard job, and click Execute Now.

1. On a CI form click Dashboard.
2. Or, navigate to CMDB Dashboard CMDB Health and click CMDB Dashboard - All to display the class hierarchy. Enter a search string and then select a CI from the Configuration Items group.

   The search results are grouped by Classes and Configuration Items that match the search string.

Various widgets in the report display CI’s health with the following color codes:

- Green: The CI passed the health test (for example, it is not a duplicate).
- Red: The CI failed the health test (for example, it is a duplicate)
- Grey: The CI was not tested for this metric, because the threshold was not set for the CI (class) in the CI module.

The report displays the change history for the CI in a timeline format, that you can zoom in or out to select a time period for which to display details for. Use the related lists tabs Change, Incident, Task, Business Services, and Alerts to further drill into additional details.

**Note:**

Missing rules or other class definitions can prevent some health scores from being evaluated for a CI. The results in the CI dashboard in these situations, are described below:

**Duplicate**

- If no identification rules ([cmdb_identifier]) are defined for the CI’s class or its ancestors: A notification to that effect appears.
London ServiceNow Now Platform Capabilities

• If only dependent identification rules are defined: Not applicable notification appears.

Orphan

• If the CI is excluded by health inclusion rules: Not applicable notification appears.

Staleness

• If no orphans rules ([cmdb_health_orphan_rule]) are defined for the CI’s class or its ancestors: A notification about missing a rule appears.

Audit

• If no staleness rules ([cmdb_health_staleness_rule]) are defined for the CI’s class or its ancestors: A notification about missing a rule appears.

• If no audits ([cert_audit]) are defined for the CI (CI dashboard checks only desired states and scripted audits): Not applicable notification appears.

• If there are audits defined for the CI but the audits did not run: Not applicable notification appears.

Customize the CI dashboard

You can add, remove or re-arrange content on the CI dashboard to display the CI health statistics that are important to you.

Role required: itil_admin

On a CI form click Dashboard and customize the CI dashboard as follows:

• Drag a tile near its upper edge and drag it to a different location on the dashboard to rearrange the current layout.

• Click the X in the upper right side of a widget to hide the widget.

• Click the + sign in the upper left corner of the dashboard to add content. In the Add content dialog box, select the content to add and the location to place it.

• Click the gear icon in a widget tile to edit widget settings such as title and height.

• Click Reset to Default to revert to the base system settings.

See the following video on YouTube: CMDB Health Dashboard for Helsinki | Overview for information about configuring and using the CMDB dashboard.

View CI relationships health

View aggregated orphan, stale, and duplicate CI relationships in the CMDB dashboard. You can configure the relationship scorecards, but you cannot configure the underlying relationship KPI health tests.

The CMDB Health Dashboard - Relationship Compliance Processor dashboard job must run to generate data for these reports.

Role required: itil or asset
CMDB Health measures CI relationship health using a separate KPI and metrics.

**Orphan relationship**  
A relationship that is missing parent, child, or relationship type.

**Duplicate relationship**  
Relationships that have identical parent, child, and relationship type.

**Stale relationship**  
A relationship in which one of the CIs is stale. For a stale CI — its associated relationships are also stale.

In addition, the following relationship compliance reports are available:

- **Relationships not compliant with all relationship rules**  
  Relationships that do not comply with any relationship governance rule, including suggested relationships and dependent relationship rules.

- **Relationships not compliant with suggested relationships**  
  Suggested CI relationships are used as rules to test if relationships comply with specified suggested relationships.

- **Relationships not compliant with containment rules**  
  Containment rules are used to test if relationships comply with specified containment relationships.

- **Relationships not compliant with hosting rules**  
  Hosting rules are used to test if relationships comply with specified hosting relationships.

For each of the compliance reports, testing a relationship requires a rule (suggested relationship, hosting rule, or containment rule) in which the parent and child CI classes match the parent and child CI classes in the tested relationship. If the relationship types in the rule and in the tested relationship do not match, then the relationship is not in compliance. If an applicable rule is not found, then the relationship is considered to be in compliance. Rules apply to the classes specified in the rule, and also to descendant classes. Therefore, when testing a relationship, rules that apply to ascendant parents of the CIs in the tested relationship are used. If there are multiple rules that match the parent and the child CI classes of the tested relationship, then the tested relationship needs to satisfy only one of these rules to be in compliance.

1. Navigate to Configuration CMDB Dashboard CMDB View.
2. Select the Relationship Health tab.
3. Scroll to the bottom of the page to examine the relationship compliance reports.
   Report results are grouped by relationship type, and you can drill down for further details:
   - Point to a relationship type to display its label and the % of relationships that are not in compliance.
   - Click on a relationship type to drill down to a detailed list of all the relations of that type that are not compliant. Click on a specific relationship to display more details such as the failure description. The Failure Description field lists only a single rule that the relationship did not comply with, even if there are additional rules that the relationship fails to comply with.

### Create CMDB remediation rule

A CMDB remediation rule is associated with a task that was created for a failed CMDB health test. A CMDB remediation rule is applied automatically or manually to execute a remediation workflow that can, for example, delete stale CIs.

You need to first create and publish a remediation workflow that addresses the CI issue. The workflow can be a regular workflow, or an Orchestration workflow, and the table in the workflow needs to match the task type in the remediation rule. Do not configure the workflow with any filter conditions by setting If condition matches to None, so that the filters of the CMDB remediation rule will apply.
Role required: itil_admin (on top of itil)

1. Navigate to Configuration CMDB Remediations.
2. Fill in the form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Remediation name.</td>
</tr>
<tr>
<td>Task type</td>
<td>Type of CMDB health-related tasks to apply the remediation to.</td>
</tr>
<tr>
<td>Task filter</td>
<td>Filters tasks to apply remediation to. Also applies <em>dot-walking</em> on CI fields so that remediation is applied to tasks associated with matching CIs.</td>
</tr>
<tr>
<td>Execution</td>
<td>• Manual: Remediation is applied manually.</td>
</tr>
<tr>
<td></td>
<td>• Automatic: The workflow is applied once, upon the creation of a task that matches the Task type and Task filter.</td>
</tr>
<tr>
<td>Active</td>
<td>Allowing the workflow to run.</td>
</tr>
<tr>
<td>Workflow</td>
<td>The CMDB remediation workflow (regular or Orchestration) that will execute automatically or manually, depending on the Execution setting. You can click the Lookup using list icon, and then click New to create a new workflow.</td>
</tr>
</tbody>
</table>

3. Click Submit.

If Execution is set to Automatic, then the business rule Run remediations for CMDBHealth task applies the remediation workflow to CIs that match the Task filter. If Execution is set to Manual, then you can manually apply the remediation workflow defined in the rule.

**Apply CMDB remediation**

Manually initiate a workflow to remediate a CI that failed a CMDB health test. For example, you can remediate CIs that are orphan or stale.

To manually apply a CMDB remediation, a CMDB remediation rule must exist, in which Execution is set to Manual.

Role required: itil_admin

Except for the duplicate and audit health metrics, you can choose to create tasks for health test failures for a metric.

To remediate failures of the duplicate metric, use *de-duplication tasks*.

For all metrics except for audit, each CI that failed a metric test is associated with a single task. Because a CI can fail multiple audits, a single CI can be associated with multiple audit tasks. The first of those tasks is in the Task field, and any additional tasks are in the Additional Tasks field. To remediate failures of the audit metric, refer to the audit tasks for the audits that the CI failed.

1. Navigate to Configuration CMDB Dashboard, and then click CMDB View, Service View, or Group View.
2. Click on one of the bars in a bar chart on the page. Or, click on a metric tile that is associated with the remediation that you want to apply, and then in a detailed report click on a bar in a bar chart. For example, to remediate an orphan CI, click the Completeness tile.

3. In the Task column in the CMDB Health Results list, select the task that is associated with the CI that you want to remediate. Point to the information icon for a result record to display the CMDB Health Results dialog box with more details about the health test. The CMDB Health Results list contains records only for the CIs that failed a metric test.

<table>
<thead>
<tr>
<th>Field</th>
<th>Column</th>
</tr>
</thead>
<tbody>
<tr>
<td>CI</td>
<td>The CI associated with the test results.</td>
</tr>
<tr>
<td>Class Name</td>
<td>The CI’s class.</td>
</tr>
<tr>
<td>Description</td>
<td>Details about the reasons for the CI failing the metric test.</td>
</tr>
<tr>
<td>Last Evaluated On</td>
<td>Time that the CI was evaluated for the metric, and which resulted in failure.</td>
</tr>
<tr>
<td>Metric</td>
<td>The CMDB Health metric associated with this test result.</td>
</tr>
<tr>
<td>Source</td>
<td>Source of the health test failure:</td>
</tr>
<tr>
<td></td>
<td>• CMDB Health Audit: Corresponds to the dashboard</td>
</tr>
<tr>
<td></td>
<td>• Cloud discovery</td>
</tr>
<tr>
<td>Task</td>
<td>The task associated with the health test failure. For the audit metric, if there are multiple failures, then only the first task is listed.</td>
</tr>
<tr>
<td>Additional Tasks</td>
<td>If there are multiple tasks related to the audit metric, contains all tasks other than the first which is in the Task field.</td>
</tr>
<tr>
<td>Active</td>
<td>Used internally in combination with the To Delete field to determine the correct results set that this failure belongs to.</td>
</tr>
<tr>
<td>To Delete</td>
<td>Used internally in combination with the Active field to determine the correct results set that this failure belongs to.</td>
</tr>
</tbody>
</table>

4. On the task form, click Remediate.
5. In the Run Remediations dialog box, select the remediation rule that you want to apply. The list of remediation rules is based on the type of health metric (such as orphan, stale), and on the filter defined in the rule.
6. Click Execute.
Components installed with CMDB Health

Several types of components are installed with CMDB Health (included in the com.snc.cmdb plugin), including tables and scheduled jobs.

**Note:** To view all other components installed with this plugin, see the Application Files table. For instructions, see *Find components installed with an application.*

### Scheduled jobs installed

<table>
<thead>
<tr>
<th>Scheduled job</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMDB Health Dashboard - Completeness Score Calculation</td>
<td>Script for calculating the completeness KPI of CMDB health.</td>
</tr>
<tr>
<td>CMDB Health Dashboard - Compliance Score Calculation</td>
<td>Script for calculating the compliance KPI of CMDB health.</td>
</tr>
<tr>
<td>CMDB Health Dashboard - Correctness Score Calculation</td>
<td>Script for calculating the correctness KPI of CMDB health.</td>
</tr>
<tr>
<td>CMDB Health Dashboard - Relationship Score Calculation</td>
<td>Script for calculating the CI relationships KPI of CMDB health.</td>
</tr>
<tr>
<td>CMDB Health Dashboard - Relationship Compliance Processor</td>
<td>Script for calculating compliance of relationships with suggested relationships, and with hosting and containment rules.</td>
</tr>
</tbody>
</table>

### Tables installed

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMDB Health Metric [cmdb_health_metric]</td>
<td>Details such as if a KPI or metric is enabled, maximum failure threshold, and other settings for all CMDB Health KPIs and metrics.</td>
</tr>
<tr>
<td>CMDB Health Result [cmdb_health_result]</td>
<td>Results from the most recent CMDB Health processing cycle.</td>
</tr>
<tr>
<td>CMDB Health Scorecard [cmdb_health_scorecard]</td>
<td>Current and historic health scores. Status of historic score records is 'Historic', and of latest score records is 'Complete'.</td>
</tr>
<tr>
<td>CMDB Health Orphan Rule [cmdb_health_orphan_rule]</td>
<td>Rules for calculating orphan records per class.</td>
</tr>
<tr>
<td>CMDB Recommended Fields [cmdb_recommended_fields]</td>
<td>Recommended fields per class.</td>
</tr>
</tbody>
</table>
## CMDB Health troubleshooting

Use the following information to track and resolve issues with the CMDB Health processes.

### Logging

By default, only error messages are logged to the syslog table, with the source name CmdbHealth. To enable logging of ‘info’ and ‘warning’ messages (which are typically logged at the start and end of each processing cycle), update the system property glide.cmdb.logger.use_syslog.CMDBHealth. For information about using this property, see [CMDB health system properties](#) on page 152.

### Processing status

If scheduled jobs are enabled, but data is not displaying on the CMDB dashboard, you can check the processing status in the CMDB Health Metric Status \([\text{cmdb\_health\_metric\_status}]\) table. Depending on the status of the inactive metric, decide how to proceed.

Initially, the state of all metrics is ‘In Progress’.

Possible final states of a metric:

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Complete</strong></td>
<td>All classes are processed and the number of failures is under the maximum failures threshold.</td>
</tr>
<tr>
<td><strong>Max Failures</strong></td>
<td>The number of failures for this metric reached the maximum failures threshold. Processing has been aborted and will start over in the next run.</td>
</tr>
</tbody>
</table>

### Table

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMDB Health Metric Status ([\text{cmdb_health_metric_status}])</td>
<td>Internal table that tracks the status of each KPI and metric that is being processed. Includes status, processing time, and processing start date. State for a KPI or metric changes from 'In Progress' to either of: • Complete • MaxFailures • Daily Processing Time Out Processing of a timed out KPI or metric continues on the following day.</td>
</tr>
<tr>
<td>CMDB Health Processor Status ([\text{cmdb_health_processor_status}])</td>
<td>Internal table that tracks the processing progress of each KPI and metric. Contains a list of tables that are processed for each KPI and metric, and processing status. Classes are processed sequentially, changing status from Draft -&gt; In Progress -&gt; Complete.</td>
</tr>
<tr>
<td>CMDB Relationship All Rules Health Results ([\text{cmdb_health_result_rel_all}])</td>
<td>Stores results about relationship health, to be used by the All Relationships report.</td>
</tr>
</tbody>
</table>
Daily Time Out Pause

The processor reached the processing time limit. Processing is paused and will resume in the next run.

At the end of a processing cycle, the final state of a KPI depends on the final state of its associated metrics. Possible final state of a KPI:

- **Complete**: All associated metrics are in Complete state and score calculation is complete.
- **Incomplete**: Score is not calculated because one of the associated metrics reached its maximum failure thresholds.
- **Daily Time Out Pause**: Timed out because one of the associated metrics has reached its processing time limit.

### Processing time

If processing of a metric times out, you can find out which class takes too long to process. Use this information to find out if any validation rules are weak.

The progress of each metric is tracked in the CMDB Health Processor Status table [cmdb_health_processor_status]. Status for classes that have been processed for a metric is Complete, and for classes that are yet to be processed is Draft. By looking at the update time for each class, you can calculate the length of processing time for each class.

### Fixing orphan records due to broken hierarchy

Orphan rules might detect an orphan CI, which you are not able to access and delete. Or, there might be a mismatch between the list view that displays the orphan records, and the total number of records. These findings are due to records being deleted in the database from only one table in the CMDB hierarchy.

These CI records are not accessible via GlideRecord and must be deleted directly from the database. Therefore, in this case, to delete an orphan CI from the database you must get help from customer support.

Orphan test results provide the details of where exactly the hierarchy is broken. For example, the message “This cmdb_ci_linux_server CI [91054fc24f22520053d6e1d18110c713] is missing record in cmdb_ci_computer table” means that a record of that sys_id must be deleted from the CMDB, cmdb_ci, cmdb_ci_hardware, cmdb_ci_server, and the cmdb_ci_linux_server tables (the Computer class is between the Hardware and the Server classes in the hierarchy.)

### Scripted audits Skipped

An error message is logged if the results from a scripted audit are not included in the compliance KPI. The reason can be that the script in the audit was not updated to populate its Last ran date field. Without a Last ran date value, CMDB Health is unable to identify these run results as part of a recent complete audit run, and skips those results.

See [prepare scripted audits for the compliance KPI](#) for information about how to resolve this issue.

### CMDB Health troubleshooting: failure threshold reached

The CMDB dashboard displays the string ‘failure threshold reached’ when the number of CIs that are failing the metric tests, reaches the failure threshold set for the metric.
CMDB Health stops processing for this metric in the current cycle, and therefore there is no aggregated health score for the metric. Processing will be attempted again in the next cycle. Also, status in the CMDB Health Metric Status [cmdb_health_metric_status] table is set to Max Failures for this metric.

When the health score of a metric cannot be evaluated, then the processing status of the respective KPI (for example, correctness) is set to Incomplete. The CMDB dashboard displays the string Incomplete score for the respective KPI and for the CMDB Health overall score. Also, aggregated health scores for the metric are not available for any class in the CMDB hierarchy.

To troubleshoot, do any of the following:

- Review and refine the rules defined for the metric which has reached max failures. If a rule associated with the metric is too generic, resulting in large number of failures, attempt to refine it. For Example:
  - Completeness – Review the recommended fields that are causing failures and remove the ones that are not critical for the health score. For more information see Set a CI field to be recommended on page 157.
  - Correctness – For the staleness metric, depending on the cause of the failures it might be helpful to increase the value of the glide.cmdb.health.staleness CMDB Health system property.
- Reduce the number of failures by fixing CI records: If after adjusting the metric test rules the max failures for some metrics is still reached, then address the failures by updating CI records with the relevant missing information.
- Increase the failure threshold for the metric that is failing and check if processing for this metric completes successfully in the next cycle. Increasing the failure threshold beyond 500K might reduce overall performance.

CMDB Health troubleshooting: incomplete score

The CMDB dashboard displays the string 'incomplete score' for a metric when it fails to calculate the score for the metric.

'Incomplete score' is displayed when:

- The number of CIs that are failing the tests of one of its sub-metric, reaches the failure threshold set for the metric. In this situation, the processing status for the respective parent metric (for example, correctness) is set to 'incomplete' in the CMDB Health Metric Status [cmdb_health_metric_status] table. Processing for the failing metric in the current cycle stops, and therefore there are no aggregated health scores for the sub-metric, the parent parent metric, or the overall CMDB Health.

To troubleshoot, resolve the underlying cause of CIs failing the sub-metric tests. See CMDB Health troubleshooting: failure threshold reached on page 176 for more information about resolving the failures of the sub-metric.
- An error is encountered while processing the sub-metric.

To troubleshoot, examine the system logs system logs to determine the cause of the error. After fixing the cause of the problem, restart processing by manually executing the respective parent metric dashboard job.

Duplicate CIs

When the instance encounters duplicate CIs during identification and reconciliation, it groups each set of duplicate CIs into a de-duplication task for review and remediation.
### De-Duplication tasks

De-duplication tasks provide details about the duplication, including a list of all the duplicate CIs. Review the details of each duplicate CI in the task and the data that was used to determine that the CI is a duplicate.

From a de-duplication task, you can run the Duplicate CI Remediator to reconcile a set of duplicate CIs into a single CI, eliminating the duplication.

### Identification properties that affect processing of duplicate CIs

During CMDB Identification, processing of sets of duplicate CIs is determined by the properties `glide.identification_engine.skip_duplicates` (true by default) and `glide.identification_engine.skip_duplicates.threshold` (5 by default), and on the number of duplicate CIs in a set.

For information about how these properties affect the management of duplicate CIs, see *Detecting duplicate CIs* on page 123.

### Duplicate CI Remediator

The Duplicate CI Remediator is a wizard-like tool that you can use to reconcile a set of duplicate CIs associated with a de-duplication task. You can choose one of the duplicate CIs to retain as an active CI, and then decide how to process the rest of the duplicate CIs. The Duplicate CI Remediator lets you set reconciliation options for attributes, relationships, and related items.

For information about using the Duplicate CI Remediator, see *Remediate a de-duplication task* on page 180.

### Review de-duplication tasks

Review details of de-duplication tasks, and then potentially remediate a de-duplication task.

Role required: itil to view and itil_admin to remediate a de-duplication task.

If a duplicate CI is a dependent CI, then you can view the details of the dependent relationship, the Depend on CI, and any relation qualifier chain. If the dependent CI has a lookup table, then you can see the details of the respective lookup table.

1. Navigate to Configuration Identification/Reconciliation De-duplication Tasks.
2. Select a task.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Unique task number.</td>
</tr>
<tr>
<td>Assigned to</td>
<td>Person who is responsible for resolving the task.</td>
</tr>
<tr>
<td>Short description</td>
<td>Description for the task.</td>
</tr>
</tbody>
</table>
3. In the related lists section, click the Duplicate Audit Results tab to see the list of duplicate CIs in this task. You can click a CI to display more CI details.

<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duplicate CI</td>
<td>Reference to the duplicate CI.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This field is a document ID type, which means that it can reference any record on any table. If the referenced CI is deleted as part of resolving duplicate tasks, then this field is empty.</td>
</tr>
<tr>
<td>Relationship</td>
<td>For a duplicate CI that is a dependent CI, this field shows the relationship between the duplicate CI and depend on CI.</td>
</tr>
<tr>
<td>Depend on CI</td>
<td>If the duplicate CI is a dependent CI, then this field displays the depend on CI.</td>
</tr>
<tr>
<td>Discovery source (Duplicate CI)</td>
<td>Discovery method used for the CI.</td>
</tr>
</tbody>
</table>

Analyze de-duplication tasks to determine which CIs should remain active and which of the duplicate CIs in the Duplicate Audit Results lists are stale or incorrect. Click Remediate to remediate a de-duplication task (requires the itil_admin role).

**Manually create a de-duplication task**

Manually create a de-duplication task when it cannot be automatically created. You can then use the Duplication CI Remediator to remediate the manually created task.

In some situations, duplicate CIs are not automatically detected and de-duplication tasks are not automatically generated. Such situation happens with a class for which identification rules are not defined and the identification engine cannot be applied. However, you still want to reconcile these duplicate CIs by utilizing the Duplicate CI Remediator.

Use the `CMDBDuplicateTaskUtils` API to manually create a de-duplication task in which all duplicate CIs are specified. The de-duplication tasks that you create manually and the automatically created tasks, are stored in the same table (`[reconcile_duplicate_task]`) and are processed in the same manner.
**Note:** You can manually create a de-duplication task only for CMDB CIs and a CI can be specified as a duplicate CI only in a single de-duplication task.

### Remediate a de-duplication task

Remediate a de-duplication task by using the Duplicate CI Remediator wizard. Use the wizard to guide you through the duplicate CI reconciliation process or to apply a custom workflow.

Important concepts and elements associated with the Duplicate CI Remediator:

**Master CI**

The master CI is one of the duplicate CIs that you want to retain as an active CI while potentially retiring or deleting the rest of the duplicate CIs. The first step in the Duplicate CI Remediator is to select a master CI for the remediation process. The Duplicate CI Remediator lets you choose which attribute values, relationships, and related items from the duplicate CIs to reconcile into the master CI. Alternatively, you can choose not to consolidate any data and retain the master CI as it is.

**Default related items list**

A list of related items that is used globally in the Duplicate CI Remediator for all de-duplication tasks. All items from the default related items list are selected by default to be merged to the master CI, on the Merge Relationships and Related Items tab. Adding or removing items from that slushbucket does not affect the default related items list. See **Manage default related items list** on page 185 for more information.

**Note:** Asset related tables are not included in the default related items list and therefore they are not available for merge.

**glide.duplicate_ci_remediator.dry_run**

This system property controls whether the Duplicate CI Remediator actually remediates CI duplication by updating records in the CMDB, or not. When set to false (default value), updates specified in the wizard are actually performed. You can set this property to true and then test run through the Duplicate CI Remediator without any records actually being updated. In this case, the work notes for the task describe the changes that will happen in an actual remediation.

Role required: itil_admin

As you progress through the tabs of the Duplicate CI Remediator, CIs are not updated. All updates are applied only in the final step, after you click Remediate.

**Note:**
- Merging of attributes and related items that are associated with assets is not supported in the Duplicate CI Remediator.
• The Duplicate CI Remediator behaves differently in remediations that involve a large number of duplicate CIs or where the duplicates are serial numbers. For information about those special cases, see the 'Special remediation scenarios' section at the bottom.

• Throughout the Duplicate CI Remediator, attributes in which max_length is greater than 4000 characters are not included in attribute lists. However, if the max_length for an attribute is 4000, and the size of the data exceeds 4000, then the data is truncated to 4000 and the attribute is included in attribute lists.

1. Navigate to Configuration Identification/Reconciliation De-duplication Tasks.
2. Open the de-duplication task that you want to remediate. On the task form, click Remediate.
3. In the RemEDIATE dialog box, select either of the following options:
   • Use the Duplicate CI Remediator (Recommended): Use the wizard to consolidate duplicate CIs according to your configurations and settings. Follow the Duplicate CI Remediator tabs to configure the reconciliation.
   • Use a custom remediation workflow: Use an existing CMDB remediation rule or select Add New to create a new one.
     • On the CMDB Remediation Rule form, set Task type to RemEDIATE Duplicate Task and select Active.
     • On the Workflow form, set Table to RemEDIATE Duplicate Task [reconcile_duplicate_task] and If condition matches to None.
     • Ensure that the associated workflow remediates duplicate CIs.

   In the RemEDIATE dialog box, click Next to start the workflow and to exit the Duplicate CI Remediator. The RemEDIATE Duplicate Task form appears, where you can update the State of the task.

4. On the Select Master CI tab in the Duplicate CI Remediator:
   a) Select the master CI for this reconciliation using either of the following lists of duplicate CIs. For any CI, you can click the Name link to display the CI's attributes, or click the Related Items link to display the number of related items.
      • Recommended: A subset of the All list, containing only system recommended master CIs. System recommendations are based on checking the duplicate CIs for the following criteria:
        • CI with most related items.
        • CI with most relationships.
        • Newest discovered CI.
        • Newest updated CI.
        • Oldest created CI.
        • Previous master CI, if one was previously selected.

      • All: All duplicate CIs for the de-duplication task.

      Either option lets you review a summary of the remediation settings before starting the remediation.

   b) Select one of the following options to choose whether to consolidate any attribute values, relationships, or related items from any of the duplicate CIs into the master CI:
      • RemEDIATE Manually: Lets you specify which attribute values, relationships, and related items from duplicate CIs to consolidate into the master CI.
      • Use Master CI: Retains master CI attribute values, merges relationships, and merges only the default related items.
5. On the Merge Attribute Values tab review inconsistent values of each attribute. For each attribute, choose to retain the master CI's value, or choose a value from a duplicate CI for the master CI to be set with. Then click Next.

<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attribute</td>
<td>Attribute for which there are different values.</td>
</tr>
<tr>
<td>Master CI Value</td>
<td>Attribute value in the master CI.</td>
</tr>
<tr>
<td>Other Values</td>
<td>The number of unique Attribute values within the duplicate CIs.</td>
</tr>
</tbody>
</table>

To override the master CI attribute value with a duplicate CI value:

a) Click the Other Values link.
b) In the attribute dialog box, click Unique Values to display only unique attribute values, or All to display all attribute values including identical values.
c) Select a value for the master CI Attribute to be set with.
   You can click Reset to Original to undo the selection of a different attribute value for the master CI.
d) Click Select.

**Note:** Attributes, such as system fields, discovery fields (discovery_source, last_discovered, first_discovered), and read-only fields (such as the asset field) do not appear in the list.

6. On the Merge Relationships and Related Items tab:

a) In the Merge Relationships section, select whether to merge all relationships from all duplicate CIs into the master CI. Click View all relationships to display all the relationships in which a duplicate CI is a parent or a child. You can click a Parent or a Child link to display more details. Orphan and duplicate relationships of duplicate CIs are deleted if you choose to merge relationships. For more information about the CMDB Health relationship KPI, see [CMDB Health KPIs and metrics](#) on page 160.

b) In the Merge Related Items section use the slushbucket to select related items to be merged into the master CI. Click View all related items to display all related tables (items) and the count of references in each table to one of the duplicate CIs. You can click the links in Master CI Related Items and Duplicate CIs Related Items to display details about the related items.
Related items in the slushbucket have the following format:

- By default, all items in the default related items list are selected to be merged.
- Related items (tables) that have no references to a duplicate CI are not listed, unless that table is included in the default related items list.
- Since asset related tables are part of the blacklist, they are not available for merge.

See *Manage default related items list* on page 185 for more information about configuring a default list of related items.

c) Click Next.

7. On the Determine Duplicate CI Actions tab, choose one of the following actions to perform after completing the reconciliation. Then click Next.

- Set attributes to custom values (recommended): Retain all duplicate CIs. Mark the duplicate CIs as invalid by setting a specific Attribute to a specific Value for all duplicate CIs. For example, set Operational Status to Retired to retire the duplicate CIs.
  
  If the identification engine is configured to *skip duplication*, then the discovery source of the duplicate CIs is automatically set to Duplicate and the duplicate CIs will not be added to any de-duplication task after this task is remediated. If skip duplication is not configured, ensure that identification inclusion rules are configured to exclude the duplicate CIs during identification. This configuration prevents new de-duplication tasks with the same duplicate CIs from being created after remediation.

  **Note:** Discovery fields, system fields, read only fields, and date fields are excluded from the attributes list.

- Delete: Delete all duplicate CIs (only the master CI remains).

  **Note:** Review *Roll back and delete recovery* for information about reverting the deletion of CIs and related records.

8. On the Review and Confirm tab:

a) Review the summary of the expected updates for this duplicate CIs reconciliation. Updates are based on your selections and therefore the summary includes only the details that are applicable. This summary can include details of the relationships and related items that will be merged to the master CI, the attribute values that the master CI will be set with, and the number of CIs that will
be deleted. Click Attributes, Relationships, Related Items, or Duplicate CI Actions if applicable, to display further details such as changes to attribute values.

b) Click Remediate to complete the reconciliation according to your reconciliation settings. Once complete, the task State is set to Closed Complete.

The following relationships are deleted without being merged to the master CI:

- Relationships in which the type, child, or parent field is empty.
- Relationships for which merging to the master CI will result in cyclic relationships.
- Relationship for which merging to the master CI will result in duplicate relationships.

The reconciliation process runs in the background and may take a while to complete. Upon completion, the system sends a confirmation notice to the remediator of the task. Meanwhile, you can:

- Review Identification Rules: Review identification and inclusion rules and make any necessary updates to reduce CI duplication.
- Check Progress: View the task activities that are logged as the remediation progresses.
- View Master CI: View the master CI for this reconciliation process.

Special remediation scenarios

There are a few special remediation scenarios in which the Duplicate CI Remediator behaves differently.

**Large number of duplicate CIs**

Support for reconciliation of duplicate CIs in the Duplicate CI Remediator is limited when the number of duplicate CIs exceeds a certain threshold. This threshold is based on the value of the glide.duplicate_ci_remediator.max.cis property, which is 1,000 by default. You can update this property to increase the threshold. However, this threshold never exceeds 5,000, even if you set the property to a value greater than 5,000.

When the number of duplicate CIs for a de-duplication task exceeds the threshold, the options available in the wizard are limited:

- On the Select Master CI tab, only the Recommended list of master CIs appears, and only the Use Master CI option is available.
- Recommendations are based only on the oldest created, newest updated, and most recently discovered CIs.
- Reconciliation of attribute conflicts and CI relationships is not supported, and only default related items are reconciled.

**Duplicate serial numbers:**

The Duplicate CI Remediator is usually applied to duplicate CMDB CIs. However, in some situations de-duplication tasks might be created for duplicate serial numbers. When the Duplicate CI Remediator processes duplicate serial numbers, the merge of relationships from duplicate records, is not referenced and is not applied.
Manage default related items list

You can add or remove items from the default list of related items which is used globally in the Duplicate CI Remediator for all de-duplication tasks.

Role required: itil_admin

The default related items list appears on the Merge Relationships and Related Items tab in the Duplicate CI Remediator. Globally modifying the list affects all de-duplication tasks being remediated by the Duplicate CI Remediator.

Alternatively, you can modify the list for only a specific task in the Duplicate CI Remediator without affecting the default global list.

Note: Only related items in which the reference field points to Configuration Item [cmdb_ci] in sys_dictionary can be selected for the default related items list. Related items with references to any child of the Configuration Item class cannot be selected for the default related items list, but are still available for merging in the Duplicate CI Remediator for a specific task.

1. Navigate to Configuration Identification/Reconciliation Duplicate CI Remediator Default Related Items.
2. On the Default Related Items List for Duplicate CI Remediator page, use the slushbucket to add or remove items from the Selected list.
3. Click Save.

Components installed with duplicate CIs

Tables installed with duplicate CIs (included in the com.snc.cmdb plugin).

Note: To view all other components installed with this plugin, see the Application Files table. For instructions, see Find components installed with an application.

### Tables installed

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RemEDIATE Duplicate Task</td>
<td>De-duplication tasks.</td>
</tr>
<tr>
<td>[reconcile_duplicate_task]</td>
<td></td>
</tr>
<tr>
<td>Duplicate Audit Result</td>
<td>Cls associated with each de-duplication task.</td>
</tr>
<tr>
<td>[duplicate_audit_result]</td>
<td></td>
</tr>
<tr>
<td>Duplicate CI Remediation</td>
<td>Input, selections on each tab, overall status of remediation, and results of each run of the Duplicate CI Remediator.</td>
</tr>
<tr>
<td>[cmdb_duplicate_ci_remediation]</td>
<td></td>
</tr>
</tbody>
</table>

CI Class Manager

Use the CI Class Manager to centrally view, create, or edit basic class definitions, and class settings for identification, reconciliation, and CMDB Health. To access the CI Class Manager, navigate to Configuration CI Class Manager.
Application services

An application service is a set of interconnected applications and hosts which are configured to offer a service to the organization. Application services can be internal, like an organization email system or customer-facing, like an organization website.

ServiceNow applications refer to devices and applications that comprise an application service as configuration items (CIs). The various CIs and the relationships between them, that comprise an application service, are stored in the CMDB.

In the base system, you can manually create an application service and then populate it by adding CIs and their relationships from the CMDB. The system generates a map which shows the CIs and relationships in the application service. The system also tracks changes to application service and shows the history of those changes in the application service map.

All application services that you create manually or by using an API, or that are discovered by Service Mapping, are stored in the Application Service [cmdb_ci_service_discovered] table.

Activating Service Mapping or Event Management provides additional functionality for creating, updating, and using application services.

Domain separation

Domain separation, if deployed, impacts application services as follows:

- When creating an application service, the application service is assigned to the user's domain.
- When manually adding a CI to an application service, you can choose only CIs that belong to the service domain.
• When using the `createOrUpdateService - POST` REST API for creating or updating an application service, the process stops if one of the CIs referenced in the API belongs to a different domain than the application service itself.

• When converting business services into application services, the newly created application service belongs to the same domain as the original business service. The application service comprises only CIs belonging to the same domain as the application service itself.

**Application services APIs**

Application services provide several APIs that you can use to perform tasks such as creating an application service or adding a CI or a connection to an application service. See *Use application services APIs* on page 214 for details about all application service APIs.

**Service Mapping**

If activated, Service Mapping discovers application services and automatically populates application services with discovered application and host CIs. If Service Mapping is activated, then an application service can comprise of manually added CIs and Service Mapping discovered CIs. Service Mapping creates and updates application services by communicating with individual CIs in the CMDB and identifying connections between the CIs. Service Mapping stores information about discovered CIs and relationships in the CMDB.

**Event Management**

Application services are associated with a criticality level which determines the prominence of an application service on the Event Management dashboard. You can also use a criticality value to define recovery strategies. For more information, see *Define criticality for application services*.

**Manually create an application service**

Create an application service that does not contain any CIs.

Role required: `app_service_admin`

An application service is a set of interconnected applications and hosts which are configured to offer a service to the organization. Application services can be internal, like an organization email system or customer-facing, like an organization website. Use application services to organize, maintain, and monitor services in your organization.

You can specify an owner for the application service. The application service owner is a user who is familiar with the infrastructure and applications making up the service. This user is the application service SME who provides information necessary for a successful creation of an application service.

An application service has an entry point, which lets users access the application service. If you are at the planning stage and do not know what the entry points are for an application service, you can create the application service without entry points. Such application service is referred to as an empty application service, to which you can add entry points at any later time.

Service Mapping, if activated, can automatically discover and map application services as described in *Application service mapping*. A discovered application service contains the CIs and the connections between them that Service Mapping discovered and mapped.

All application services, both manually created and discovered by Service Mapping, are stored in the Application Service [cmdb_ci_service_discovered] table.
You can also create an application service by using the `createOrUpdateService - POST` REST API.

1. Navigate to Configuration Application Services Application Services.
2. Click New.
3. Specify the basic application service attributes.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter the application service name. This name must be unique. Use self-explanatory names such as mailing service or printing service.</td>
</tr>
<tr>
<td>Owner</td>
<td>Select an owner who is responsible for this application service in the organization.</td>
</tr>
</tbody>
</table>

4. Add entry points:
   a) In the Add Entry Point section, fill out the form:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CI Type</td>
<td>Select the CI type (CI class) for the CI you are adding. Every CI belongs to a CI type which contains a set of attributes configured for this kind of CI, for example, <code>cmdb_ci_appl</code> for applications.</td>
</tr>
<tr>
<td>CI Name</td>
<td>Select the CI from the list of CIs of the selected CI type.</td>
</tr>
</tbody>
</table>

The CI type list includes only allowed CI types. For example, you cannot add an application cluster.

b) Click Add.

c) To add additional entry points, click Add Entry Point and fill out the necessary details.

5. Click Save.

This application service is added to the Application Service `cmdb_ci_service_discovered` table.

*Manually add CIs to an application service* on page 190

**Convert a business service to an application service**

Unify the way you manage services in your organization by converting manually created records in the Business Service `cmdb_ci_service` table into application services. Using application services lets you view maps and change history for services. If Event Management is deployed, you can monitor service performance and identify health issues for application services.

Role required: `app_service_admin`

During conversion:
- The service record is moved from the Business Service `cmdb_ci_service` table into the Application Service `cmdb_ci_service_discovered` table by changing the record class.
- The application service is set with all the original business service attributes such as name, owner, and operational status.
• The system adds related items from the business service to the converted application service, up to the specified level.

• All connections created between CIs in an application service are of the Depends on::Used by relationship type. You can modify this default relationship type by changing the value of the `sa.it_service.manual_ci_rel_type` property.

• The system queries the CMDB for the latest CI changes.

• Event Management, if activated, applies CI impact rules to CIs that are associated with alerts and that are part of the application service. Event Management deploys CI impact rules for alert monitoring.

A conversion might involve adding CIs of the following CI types, which cannot be added to an application service:

• `cmdb_ci_endpoint`
• `cmdb_ci_translation_rule`
• `cmdb_ci_config_file`
• `cmdb_ci_qualifier`
• `cmdb_ci_application_cluster`

If the original business service contains related items belonging to these CI types, then the system does not add such CIs or connections coming from them. If necessary, you can prevent CIs of other CI types from being added to application services by modifying the `sa.mapping.user.manual.citype.blacklist` property.

In environments with domain separation, only CIs belonging to the same domain as the application service are added to the application service. If there is a domain hierarchy, CIs must belong to the same child domain as the application service.

1. Navigate to Configuration Business Services.
2. Select the business service that you want to convert to an application service.
3. Click Convert to Application Service.
4. Select a number from the Up to list, as the number of levels of related CIs to include in the conversion. The maximal number of levels is eight.
5. Click OK.

The system adds the CIs from the business service to the converted application service.

**Manually update an application service with changes from the CMDB**

Ensure that an application service is up-to-date and reflects all the latest changes to its configuration items (CIs). Regularly update application services to reflect any changes to CIs and their relationships in the CMDB.

Role required: `app_service_admin`

An example of a change is deleting CIs from the CMDB or connecting two CIs one of which is part of an application service. In the first case, your application service may show a CI that no longer exists. In the second case, on the contrary, the application service omits a CI.

There is no mechanism or an API that automatically updates application services that were created manually. Also, you may need to manually update application services discovered by Service Mapping, if they contain manually added CIs. You can only update application services which contain manually created entry points and which are not discovered by Service Mapping.

An update might involve adding CIs of the following CI types, which cannot be added to an application service:

• `cmdb_ci_endpoint`
- cmdb_ci_translation_rule
- cmdb_ci_config_file
- cmdb_ci_qualifier
- cmdb_ci_application_cluster

If necessary, you can prevent CIs of other CI types from being added to application services by modifying the `sa.mapping.user.manual.citype.blacklist` property.

All connections created between CIs in an application service are of the Depends on::Used by relationship type. You can modify this default relationship type by changing the value of the `sa.it_service.manual_ci_rel_type` property.

Also, the system can connect a CI from the application service only to actual CIs that exist in the CMDB, not a visualization of other items on the map like clusters or boundaries.

In environments with domain separation, only CIs belonging to the same domain as the application service are added into the application service. If there is a domain hierarchy, CIs must belong to the same child domain.

You can also update application services by using APIs.

1. Navigate to Configuration Application Services Application Services.
2. Alternatively, if Service Mapping is deployed, navigate to Service Mapping Services Application Services.
3. Select the application service that you want to update.
4. Click Update with CIs from CMDB under Related Links.
5. Select a number in the Up to list to limit the number of levels of related items to be updated.
   
   If the specified number is higher than the number of levels of related items that already exist in the application service, then the system adds the missing CIs and their connections.

   **Warning:** Specifying a lower number than the number of levels that already exist in the application service, does not result in the removal of CIs from the application service.

6. Click OK.

   - The system updates the application service with the changes from the CMDB and shows them on the map.
   - After the update process is complete, the application service form opens.

**Manually add CIs to an application service**

Add configuration items (CIs) to manually created application services or to services discovered by Service Mapping.

- Verify that the CI type for the CI that you are planning to add, exists. If necessary, create the CI type as described in *Create CI types for Service Mapping and Discovery*.
- Add CIs to the CMDB for the device or application that you want to add, if necessary. See *Populate the CMDB* on page 42 for more information.

Role required: app_service_admin or sm_admin

You can populate an application service that was created manually, by manually adding the CIs comprising it. Adding a CI to an application service requires creating a relationship between the new CI and a CI in the application service.

Information about the CI in application service, to which you are connecting a new CI, is updated in the CMDB. This information includes the type of the relationship between the CIs. If other application services
use the same applicative flow, the CMDB recognizes it and adds the CI you added manually to these application services by analogy. For example, you manually added an IBM WebSphere Message Broker to an IBM WebSphere HTTP Listener in the Bank Customer Portal service. The system also adds this IBM WebSphere Message Broker to the same HTTP Listener in the Bank Internal Portal, because it uses this HTTP Listener. The same logic applies when you remove a CI you added manually: The system removes it from all application services where you either manually added it or the system added it by analogy.

All connections created between CIs in an application service are of the Depends on::Used by relationship type. You can modify this default relationship type by changing the value of the sa.it_service.manual_ci_rel_type property.

You can manually connect a CI only to actual CIs existing in the CMDB, not to a visualization of other items on the map such as clusters or boundaries. Also, it is prohibited to add CIs of these CI types to an application service:

- cmdb_ci_endpoint
- cmdb_ci_translation_rule
- cmdb_ci_config_file
- cmdb_ci_qualifier
- cmdb_ci_application_cluster

If necessary, you can prevent CIs of other CI types from being added to application services by modifying the sa.mapping.user.manual.cititype.blacklist property.

In environments with domain separation, only CIs belonging to the same domain as the application service are added to the application service. If there is a domain hierarchy, CIs must belong to the same child domain as the application service.

If working with an application service discovered by Service Mapping, manually add a CI:

- To indicate that an application service contains a device or application, which Service Mapping cannot discover. For example, add an A/C unit to the Production Floor service.
- To add a temporary placeholder for a CI, which Service Mapping did not discover. In this case you are planning to perform necessary troubleshooting to ensure that Service Mapping discovers this CI in the future. For example, add an IBM WebSphere Message Broker to the Bank Customer Portal service.
- To create an application service that combines entry points and CIs automatically discovered by Service Mapping with entry points and CIs from the CMDB. After you manually add an entry point, you can update the application service with CIs from the CMDB based on the relationships defined there.

For additional information related to Service Mapping, see Pattern customization and Enable traffic-based discovery for CI types or specific CIs.

1. Navigate to Configuration Application Services Application Services.
2. Alternatively, if Service Mapping is deployed, navigate to Service Mapping Services Application Services.
3. Open the relevant application service map:
   a) Click View map next to the relevant application service.
   b) If needed, click Edit to ensure that the map is in Edit mode.
      If Service Mapping is deployed, then in Edit mode, the Discovery Messages section appears below the map.
4. To connect a CI to another CI on the map, right-click the CI to which you want to connect the new CI, and then select Add a CI.
5. In the Add A CI dialog box, specify the CI to add:
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CI Type</td>
<td>Select the CI type (CI class) for the CI you are adding. Every CI belongs to a CI type which contains a set of attributes configured for this kind of CI, for example, cmdb_ci_appl for applications.</td>
</tr>
<tr>
<td>CI Name</td>
<td>Select the CI from the list of CIs of the selected CI type.</td>
</tr>
</tbody>
</table>

The CI type list includes only allowed CI types. For example, you cannot add an application cluster.

6. Click Submit.

   The manually added CI appears on the map.

   **Note:** When you manually add a CI, which is an application, as a child to a service that already includes its parent application CI, the newly added child application CI is hidden inside the inclusion. Click the plus (+) symbol next to the parent application CI to see the child application CI.

7. (If Service Mapping is activated) To add a discoverable outgoing connection for the manually added CI:
   a) Right-click the manually added CI.
   b) Select Manually add a connection.

      **Note:** If you do not see the Manually add a connection option in the right-click menu, check that you are logged in with the user that belongs to the same domain as the application service.

   c) Configure attributes for the entry point as described in [Entry point attributes](#).
   d) Click Submit.

      Discovery and Service Mapping attempt to discover this CI. If successful, the CI appears on the map. Otherwise, a warning icon appears.

8. (If Service Mapping is activated) If you want Service Mapping to automatically discover a CI, which you previously added manually:
   a) Customize the relevant pattern or fine-tune traffic-based discovery to enable Service Mapping to discover the CI.
   b) Navigate to the relevant application service map.
   c) Click Run discovery.
   d) After the discovery process finishes, verify that Service Mapping discovered the CI by checking the connector leading to the CI. If Service Mapping discovered the CI, then two connectors, a manual and automatically discovered, appear for the CI.
e) Right-click the CI you added manually.
   In the example, it is IBM WebSphere Message Broker.

f) Select Remove manually added CI.
   The map shows the CI with only one connector leading to it. If this CI had any manually added
   connections, they are removed together with the manually added CI.

Link application services

You can manually add to one application service a reference to another application service.
Ensure that you know the name of the application service that you want to add a reference to.

Role required: app_service_admin or sm_admin

An application service can be part of another application service, in which case you can link one to
the other. To link, edit an application service, and add a reference to another application service as an
outgoing connection of the relevant CI inside the other application service.
When you link an application service to another application service, the information about the CI, to which you linked the service, is updated in the CMDB. The CMDB recognizes other application services that use the same applicative flow, and adds the application service you linked to these application services by analogy. The same logic applies when you remove a linked application service: The system removes it from all application services where you either manually linked this service or the system linked this service by analogy.

When using Service Mapping, you may want to link application services to create:

- A link between two discovered services.
- A placeholder for a map branch that Service Mapping failed to discover. If you modify or add a pattern that can discover the configuration item (CI) serving as an entry point for the linked application service, Service Mapping can discover this linked service.
- An indication that an application service contains a branch, which Service Mapping cannot discover.

You can link application services to one another to create dependencies for impact monitoring in Event Management.

1. Navigate to Configuration Application Services Application Services.
2. Alternatively, if Service Mapping is deployed, navigate to Service Mapping Services Application Services.
3. Click View map next to the application service which you want to link to another application service.
4. Right-click the CI to which you want to link an application service as a reference.
5. Select Add A CI.
6. In the Add a CI dialog box, select the application service you want to add as a reference:
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CI Type</td>
<td>Select Application service from the list.</td>
</tr>
<tr>
<td>CI Name</td>
<td>Select the name of the application service that you want to link as a reference.</td>
</tr>
</tbody>
</table>

7. Click Submit.
   The icon for the linked service appears on the map.

Navigate to the linked application service, and double-click its icon on the map. The map window shows the linked application service.

**Group application services**

Organize application services by groups to perform actions simultaneously on multiple services, and to control user access to services. You can use Event Management to track service health by service groups.

Role required: sm_admin or app_service_admin

Typically, enterprises have hundreds of services which makes it impractical to manage them individually. Service groups can make service lists much shorter and easier to manage, especially in large organizations or service providers.

How you group application services depends on the user and on service provisioning policies in your enterprise. The relation between application services in groups is purely logical and the same application service can belong to multiple groups. For example, the Mobile service can be part of the following service groups: sales, Beijing, and telephony.

![Figure 12: Example of an application service belonging to different groups](image)
You can embed a service group within another service group to create a hierarchy of service groups. If users have access to a parent service group, they automatically have access to all its child groups.

If Service Mapping is activated, service groups can contain a mixture of manually created application services and application services discovered by Service Mapping.

1. Navigate to Configuration Application Services Service Groups. Or, if Service Mapping is activated, navigate to Service Mapping Services Service Groups.
2. Click New.
3. Enter the name of the new application service group in the Name field.
4. To embed this group in another group, enter the name of the other group in the Parent Group field.
5. Right-click the form header and click Save.
6. Add an application service to the newly created service group.
   a) In the Service Group Members section, click New.
   b) In the Name field, enter the name of the application service. If you are using Event Management, you can also enter an alert group name.
   c) Click Submit.
7. Alternatively, add an application service to a group from the application service form.
   a) Navigate to Configuration Application Services Application Services.
   b) Select the application service you want to add to a service group.
   c) In the Service Group Members section, double-click Insert a new row.
   d) Enter the name of the service group to which you want to add the selected application service.
   e) Click the OK icon (✓).
   f) Click Update.

Control user access to application services

Assign user roles to service groups to grant users access to application services in your organization. Your organization may restrict access to some services for security or secrecy reasons.

Make sure that you have performed the user provisioning tasks for the users you want to grant access:

1. Add users to user groups.
2. Create new roles.
3. Assign roles to users or user groups.

Also, make sure that you have created service groups as described in Group application services on page 195.

Role required: app_service_admin or sm_admin

In the base system, the following roles provide access to application services:

**app_service_admin**

Creates and modifies application services, creates service groups, views, and edits application service maps.
app_service_user

Views application service maps. The itil role that serves as the basic helpdesk technician role contains the app_service_role.

Service Mapping provides these preconfigured roles:

sm_admin

Sets up the Service Mapping application. Maps, fixes, and maintains application services. Also performs advanced configuration and customization of the product. Assign this role to application administrators.

sm_user

Views application service maps to plan change or migration, as well as analyze the continuity and availability of services. Assign this role to application users.

sm_app_owner

Provides information necessary for successful mapping of an application service. Once a service is mapped, this user reviews the results and either approves it or suggests changes. Assign the sm_app_owner role to users who own application services and are familiar with the infrastructure and applications that make up the services.

Event Management provides these preconfigured roles:

evt_mgmt_admin

Has read and write access to all Event Management features to configure Event Management.

evt_mgmt_operator

In addition to the evt_mgmt_user permissions, can also activate operations on alerts such as acknowledge, close, open incident, and run remediations.

evt_mgmt_user

Has read access to all Event Management features. Has write access to alerts to manage the alert life. Has the itil role to be able to manage incidents that are created from alerts.

evt_mgmt_integration

Has create access to the Event [em_event] and Registered Nodes [em_registered_nodes] tables to integrate with external event sources.

Typically, enterprises have hundreds of services which makes it impractical to manage them individually. Service groups can make service lists much shorter and easier to manage, especially in large organizations or service providers. In a hierarchy of service groups, access to a parent service group automatically grants access to all the child service groups.

Users inherit permissions from roles that are assigned to them. You can assign some roles directly to service groups to allow all users with this role to access all application services belonging to this group. However, most enterprises choose to organize their roles as a hierarchy. It helps to manage roles across multiple ServiceNow applications. For example, the Service Mapping administrator [sm_admin] can be part of a broader administrator role like administrator [admin]. You can add users to user groups and then assign roles to the user groups to give permissions of this role simultaneously to all the group users.
Figure 13: Assigning a role to an application service group

In the base system, all services are assigned to the All service group that lets all users view and manage application services. When you assign a role to a service group, the users with this role can access only application services in this service group. To enable users with this role to access other services, assign this role to the respective service group.

**Note:** Some references in the user interface to business services are actually references to application services.

1. Navigate to either of the following:
   - Configuration Application Services Service Group Responsibilities.
   - If Service Mapping is activated: Service Mapping Services Service Group Responsibilities.
   - If Event Management is activated: Event Management Services Service Group Responsibilities.

2. Click New and fill out the Business Service Group Responsibilities form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Service Group</td>
<td>Service group to which you want to assign a role.</td>
</tr>
<tr>
<td>Role</td>
<td>Role you want to assign to the selected service group. For example, financial_services_admin.</td>
</tr>
</tbody>
</table>

3. Click Submit.

To manage access to services that contain sensitive financial information in your organization:

1. Organize the services into the Financial Services group.
2. Create a new user role, financial services administrator [financial_services_admin] role, that contains the [app_service_it] role.

3. Assign the Financial Services administrator role to the Financial Services group.

As a result, only users with the Financial Services administrator role can access application services belonging to the Financial Services group.

View an application service map in base system

An application service map provides a visualization of data for the CIs comprising an application service, and the relationships and connections between these CIs.

Role required: app_service_user to view the map in View mode, and app_service_admin to modify services in Edit mode.

When you create an application service, the system generates an associated application service map. The system then updates the map to reflect any changes to the application service. This map consists of icons representing CIs and arrows that represent the connections between them.

If Service Mapping is deployed, see Application service maps and View CI connection attributes in an application service map for more details.

To open an application service map, navigate to Configuration Application Services Application Services and then click the View map link. You can then perform any of the following operations.

- Click ⤦ on the windows bar to navigate to a different application service.
- Use the navigation tools to increase or decrease the view of the map and to move the map on the page. You can also click anywhere on the map area and drag a segment of the map into the visible area.
- View changes: You can view changes and change records associated with the application service as a whole or with any of its CIs, within a time range. For more information, see View the change history of application services on page 204.

Records under the Change tab underneath the map, which are associated with a selected CI or connection, are highlighted. If you select a change record under the Change tab, then the associated CI icon appears yellow on the map.
- View attributes: When you select a device, application, or connector on the map, it appears in blue and its attributes appear in the Properties pane on the right of the map. When nothing is selected on the map, the details of the application service itself appear on the Properties pane.

- Open the CI's form for further details by clicking Detailed Properties at the bottom of the Properties pane.

- Click Edit or View to switch the map mode. Edit mode lets you add or remove CIs from the map.

- Click for Additional actions:

  - Set Group CIs on map: Simplify maps by grouping 10 or more CIs belonging to the same type and hosted on servers sharing prefix and domain name.
  - Set Spanning tree view: Simplify the map by organizing CIs into a tree structure and hiding some connection lines. This option is especially useful for very large maps.
  - Map Indicators: Show additional information for a CI or for the application service itself by displaying related records such as alerts, outages, incidents, and problems. For each indicator that is enabled, the corresponding indicator icon appears next to CIs with associated records, and the corresponding tab appears underneath the map. If a record is associated with the application service itself, the indicator appears next to the application service name.

  For information about managing map indicators, see Create or modify map indicators on page 255. For more general information, see Event Management Map Indicators (Video).

  - Export to PDF: Export the map to a .PDF file which you can then share as needed. After the PDF file is ready, click to download the PDF file to your local drive.

- View the details of a connection.

  By default, connection lines for the same CI on an application service map, are merged. This merge reduces clutter on the map and helps to make the map more readable. For a merged connection line, you can view details for all the underlying connection lines.
- To view the source and target CIs of a connection, right-click a connection line.
  If spanning tree view is enabled:
  1. Click the CI whose connections you want to view to show all the concealed connections for the CI.
  2. Right-click one of the connection lines.

- To view properties of a connection, click a connection line. For manually added connections, Endpoint Type is Manual Endpoint.

- To view properties of a connection within a merged connection:
  1. Right-click the merged connection line.
  2. Select one of the connections.
  3. Select Select edge.
You can change the details that appear in the Properties pane by updating the form view 'Form view and section', as described in Configuring the form layout.

View CI attributes in an application service map

An application service map displays attributes for each configuration item (CI) that is part of the application service, as well as for the application service itself. The attributes come from the CMDB.

Role required: sm_admin or sm_user

You can view the following information for each CI:

| Name label | The CI name. This attribute is either preconfigured on the CI or configured during CI installation. |
| Basic attributes | A summary of the most important CI attributes. |
| Detailed attributes | A complete list of all attributes collected for the CI. |

Each CI type (CI class) has different attributes. For example, the Linux Server type has different attributes than the SQL Instance type.

If Service Mapping is deployed, the way CIs appear on the map depends on the view you select for the map. Attributes available for viewing also depend on the Service Mapping setup. For more information see description of components installed with Service Mapping.

The following user interface screens refer to application services as business services: Business Service Group Responsibilities, Approve, Service Mapping Properties, and Service Map Planner.

1. Navigate to Configuration Application Services Application Services .
2. Alternatively, if Service Mapping is deployed, navigate to Service Mapping Services Application Services .
3. Click View Map next to the relevant application service.
4. To see the full name of a CI whose name has been shortened on the map, point to the CI. A tooltip displays the full CI name.
5. Click a CI to see its details in the Properties pane.
   The attributes of applications and the servers that host them appear separately.
6. To view more detailed attributes for the CI, click Detailed properties at the bottom of the Properties pane.

7. (If Service Mapping or Discovery are enabled, and if tracking changes to configuration files is enabled for a CI) To view configuration files associated with a CI:
   - Review the list of files under Tracked Files in the Properties pane. Click the file name to open the actual file.
   - Click the Affected CIs tab and view the list of configuration files. Click the file name to open the actual file.
View the change history of application services

You can view changes made to an application service as a whole and to the individual configuration items (CIs) comprising the service. Change history is useful for maintenance, planning, or troubleshooting procedures.

Role required: admin, sm_admin, sm_user, app_service_admin, or app_service_user

Details about changes to an application service and to its CIs is stored in the CMDB. Typically, these changes reflect adding or removing CIs from an application service, upgrading or updating CIs, or modifying CI configuration files. The system gathers this data by querying CMDB tables and then creating the change history view. In deployments where Service Mapping is activated, the type of change information Service Mapping queries depends on discovery patterns that Service Mapping uses to discover CIs.

Changes to configuration files are associated with CIs to which these files belong. Maps show configuration file changes as changes to related CIs.

While you can see change records for a specific CI in the context of application services, you can also see detailed history of a specific CI separate from its application service as described in History Timeline.

If the Now Platform is configured to validate changes, all changes are evaluated and rendered as valid or not. If a change is valid, its change record on the application service map is marked as approved. For more information about configuring the Now Platform for change validation, see Managing proposed changes on page 47.

Changes to the application service appear on the history timeline.

The type of change mark depends on the nature of changes that it represents:

- **Light gray balloon**
  - Unapproved change that does not influence the application service behavior. For example, a change in a network path or adding a node to a cluster.

- **Dark gray balloon**
  - Unapproved change that changes the application service behavior.

- **Green balloon**
  - An approved change in deployments where the Now Platform is configured to validate changes.

- **Double balloon**
  - Multiple separate changes that happened a short time from each other.

You can mark times on the history scale by creating baselines to quickly return to the marked view.
The following user interface screens refer to application services as business services: Business Service Group Responsibilities, Approve, Service Mapping Properties, and Service Map Planner.

1. Navigate to Configuration Application Services Application Services.
2. Alternatively, if Service Mapping is deployed, navigate to Service Mapping Services Application Services.
3. Click View map for the application service for which you want to see change history. Actions or map elements which are relevant only for application services discovered by Service Mapping, do not appear on maps for manually created application services. The Changes tab at the bottom of the page shows all change records created for this application service.

4. On the history timeline, set the time range of changes that you want to view.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>To set the time range of the history timeline</td>
<td><img src="image" alt="Clock icons" /> Click the hour, day, week, or month icons.</td>
</tr>
<tr>
<td>To increase or decrease the time range</td>
<td><img src="image" alt="Zoom icons" /> Click the zoom in and zoom out icons.</td>
</tr>
<tr>
<td>To change the upper limit on your history range</td>
<td><img src="image" alt="History scale" /> Click the history scale.</td>
</tr>
</tbody>
</table>

The time that serves as the upper limit appears above the history timeline.

**Note:**
You cannot set the lower limit on your history range to a time before this application service was created. This time is marked with the IT Service Created event on the history timeline.
The map shows the history view of the application service for the time you selected.

**Note:** The Change tab shows all change records, even the ones which are filtered out of the history view.

5. To mark a time on the time scale, set a baseline:
   a) Click the Compare icon.

   ![Compare icon](image)

   b) Navigate to the time you want to mark as a baseline on the history scale.
   c) Click Set baseline.

   ![Set baseline](image)

   d) Enter the name of the baseline and click OK.
   The new baseline appears as a button above the history scale and as a blue flag on the history scale.

   ![Baseline button](image)

6. View the change history:
To see the CI responsible for a change record

Select a change record on the Changes tab. The related CI is marked yellow in the map.
<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>To see only change records related to a CI</td>
<td>Select the required CI or the connection on the map.</td>
</tr>
<tr>
<td></td>
<td>The Changes tab displays only change records related to the selected CI or connection.</td>
</tr>
</tbody>
</table>

To see the configuration file at the selected moment in the past

1. Set the time on the history scale.
2. In the Properties pane, scroll to Tracked Configuration Files, and click the file name. The new tab opens displaying the content of the tracked configuration file at the selected time.
<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
</table>
| **To see network at the selected moment in the past** | 1. Set the time on the history scale.  
2. Right-click the connection and select Show network path.  
The new tab opens displaying the network or storage path map for the time you selected.  

**Note:** You cannot view the network path for connections marked as boundaries to this application service.  

7. To exit the history view and see the current status of the application service, click the current icon. |

---

**Compare two versions of an application service**

You can see a summary of application service changes at a glance by comparing two versions of an application service. This feature is useful for checking the application service status before and after a certain change or problem.

Role required: admin, app_service_admin, app_service_user, sm_admin, or sm_user

Specify two points in time for which to compare the two versions of an application service. You can use the change indicators on the timeline to specify one point in time that is before and another that is after a change for which to see the details. For example, if you know that the application service started to fail at a certain time, you can compare two versions of the application service, one before and one after the problem started. This comparison lets you see the summary of changes that possibly led to the problems.

Service Mapping, if deployed, tracks and shows all changes to a CI including configuration files associated with a CI. When you compare two versions of an application service, you can see changes made to configuration files as changes to CIs. You can also compare two versions of a configuration file to see the actual changes in the files, during the time range specified for the comparison.

The following user interface screens refer to application services as business services: Business Service Group Responsibilities, Approve, Service Mapping Properties, and Service Map Planner.

1. Navigate to Configuration Application Services Application Services.
2. Alternatively, if Service Mapping is deployed, navigate to Service Mapping Services Application Services.
3. Click View Map next to an application service.
4. On the history timeline, set the time range of changes that you want to view.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>To set the time range of the history timeline</strong></td>
<td>Click the hour, day, week, or month icons.</td>
</tr>
<tr>
<td>Option</td>
<td>Action</td>
</tr>
<tr>
<td>-------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>To increase or decrease the time range</td>
<td>Click the zoom in and zoom out icons.</td>
</tr>
<tr>
<td>To change the upper limit on your history range</td>
<td>Click the history scale.</td>
</tr>
</tbody>
</table>

The time that serves as the upper limit appears above the history timeline.

**Note:**
You cannot set the lower limit on your history range to a time before this application service was created. This time is marked with the IT Service Created event on the history timeline.

The map shows the history view of the application service for the time you selected.

**Note:** The Change tab shows all change records, even the ones which are filtered out of the history view.

5. Click the Compare icon.

6. Set Compare point 1 and Compare point 2 as the two points in time for the comparison. You can drag the pointers on the history scale to set corresponding time points.
If the history scale does not include the time set for comparison, then its corresponding pointer appears next to the compare point in yellow:

**Note:** If there are no changes to the service during the time interval specified by Compare point 1 and Compare point 2, then no change details are displayed.

7. Click Compare.
   
The comparison view opens in a separate tab.
8. Select a marked CI to see the relevant change record on the Changes tab.
9. If Service Mapping is deployed, you can compare two versions of a configuration file that appears on the map as Updated:
   a) Select the CI that is associated with the updated configuration file.
   b) In the Properties pane, click the link to the updated file.
c) Review actual changes.
Highlight colors indicate the type of change:
• Purple — Updated line
• Pink — New line
• Gray — Deleted line

d) Navigate between the changes using the arrows in the upper right corner.
e) Close the Tracked Configuration Files Version Compare tab when finished.

10. Close the comparison view when finished.
Use application services APIs

Application services provide APIs that let you perform operations such as creating and updating an application service, populating it with CIs from the CMDB, and retrieving details from an existing application service.

Role required: app_service_admin

An application service is a set of interconnected applications and hosts which are configured to offer a service to the organization. Application services can be internal, like an organization email system or customer-facing, like an organization website.

Create an application service

Using the `createOrUpdateService - POST` REST API to create an application services suits your organization if the ServiceNow CMDB already contains the CIs making up the service. Typically, it is the case when you have manually added CIs directly into the CMDB, or used the Discovery application to discover CIs and store information about them in the CMDB. You can also use this API to create application services containing CIs discovered using non-ServiceNow applications.

By default, when an application service is created, all CI connections are of the Depends on::Used by relationship type. You can modify this default type by changing the value of the `sa.it_service.manual_ci_rel_type` property.

Before creating an application service, ensure that:

- The CMDB contains all the CIs comprising the application service.
- You have the sys_id of each CI comprised in the application service you want to create.
- You understand the hierarchy that the CIs form.

The Application Service [cmdb_ci_service_discovered] table contains all application services including services you create using APIs.

You can also manually create application services using the user interface as described in Manually create an application service on page 187.

Retrieve content from an application service

Use the `getContent - GET` REST API to retrieve a list of CIs and the relationships between them, for an application service that was created manually.

Additional APIs

The following JavaScript APIs are also available:

- `addCI()`: Add a CI to a manually created an application service.
  For restrictions on the CIs being added and other details about adding CIs to application services, see Manually add CIs to an application service on page 190.
- `addManualConnection()`: Add a manually created connection to an application service.
- `migrateManualToApplicationService()`: Convert a manual service to an application service.
- `populateApplicationService()`: Populate an application service with CIs and relationships from the designated entry point.
- `removeCI()`: Remove a manually created CI from an application service.
• `removeManualConnection()`: Remove a manually created connection and the connected CI from an application service.

Components installed with application services

Several types of components are installed with activation of the Application Service [com.snc.cdmdb.it_service] plugin, including tables, user roles, and scheduled jobs.

**Note:** To view all other components installed with this plugin, see the Application Files table. For instructions, see *Find components installed with an application.*

### Roles installed

<table>
<thead>
<tr>
<th>Role title [name]</th>
<th>Description</th>
<th>Contains roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>[app_service_user]</td>
<td>Provides read-only access to application services, and ability to call any GET APIs (GetContent).</td>
<td>• None</td>
</tr>
<tr>
<td>[app_service_admin]</td>
<td>Provides access to all basic functionality related to application services. This basic functionality includes creating services, and adding and removing CIs from services.</td>
<td>• itil</td>
</tr>
</tbody>
</table>

### Tables installed

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BaseLines [sa_baselines]</td>
<td>Storing points in the time defined as baselines for application services.</td>
</tr>
<tr>
<td>Business Service User preferences [sa_business_service_user_prefs]</td>
<td>User preferences associated with a specific application service.</td>
</tr>
<tr>
<td>Menu Action [sa_context_menu]</td>
<td>Data on configurable menu options for CIs in the application service map.</td>
</tr>
<tr>
<td>Hash [sa_hash]</td>
<td>Internal table which contains counters and hashes on various types of updates related to application services.</td>
</tr>
<tr>
<td>Entry Point [sa_m2m_service_entry_point]</td>
<td>Maps entry points to application services.</td>
</tr>
<tr>
<td>Discovered Service Notification [sa_notification]</td>
<td>Internal table which contains data on notifications between different parts of the software. Mostly used after activating Service Mapping.</td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Service Group Members</td>
<td>Maps service groups to application service members.</td>
</tr>
<tr>
<td>[sa_service_group_member]</td>
<td></td>
</tr>
<tr>
<td>Business Service Group Responsibilities</td>
<td>Data on users having access to application service groups.</td>
</tr>
<tr>
<td>[sa_service_group_responsibilities]</td>
<td></td>
</tr>
<tr>
<td>Checkpoint Attribute Description</td>
<td>Links between history timeline changes and service model internal entities (checkpoints). Used in lists of history of changes in application service maps.</td>
</tr>
<tr>
<td>[checkpoint_attribute_description]</td>
<td></td>
</tr>
<tr>
<td>Monitored Service</td>
<td>Services that can be monitored by the system, which in the base system, includes only application services. If Service Mapping is activated, there can also be records for technical services. If Event Management is activated, there can be records for alert groups.</td>
</tr>
<tr>
<td>[cmdb_ci_service_auto]</td>
<td></td>
</tr>
<tr>
<td>Application Service</td>
<td>Application service CIs. For each application service, there is a container CI record that models the application service.</td>
</tr>
<tr>
<td>[cmdb_ci_service_discovered]</td>
<td></td>
</tr>
</tbody>
</table>

**Properties installed**

To access application services properties, navigate to Configuration Application Services Properties. The role required for modifying property values, is app_service_admin.

If Service Mapping is deployed, see Properties installed with Service Mapping for additional application service properties.

<table>
<thead>
<tr>
<th>Property</th>
<th>Usage</th>
</tr>
</thead>
</table>
| The sys_id of the default relation type to be added between source and target when adding CI manually to application service sa.it_service.manual_ci_rel_type | • Type: string  
• Default value: 5599a965c0a8010e00da3b58b113d70e (Depends on::Used by)  
• Learn more: Manually add CIs to an application service on page 190 |
| Coefficient of aggregation interval. 0 value means no aggregation is performed on history timeline. The purpose of this property is to decrease number of changes in history timeline by increasing the interval allowed between changes sa.history.aggr_interval_coef | • Type: integer  
• Default value: 1 |
<table>
<thead>
<tr>
<th>Property</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A list of comma delimited CI types that are excluded when using the 'Convert to Application Service' and 'Populating Application Service from CIs in the CMDB' operations. Example: cmdb_ci_service,cmdb_ci_endpoint,cmdb_ci_hardware</td>
<td>This exclusion list applies when:</td>
</tr>
<tr>
<td></td>
<td>• Manually adding CIs to an application service</td>
</tr>
<tr>
<td></td>
<td>• Converting a business service to an application service</td>
</tr>
<tr>
<td></td>
<td>• Creating or updating an application service using APIs</td>
</tr>
<tr>
<td></td>
<td>• Manually updating an application service with changes from the CMDB</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: None</td>
</tr>
<tr>
<td>sa.mapping.user.manual.citype.blacklist</td>
<td></td>
</tr>
<tr>
<td>Sync Service Mapping operations with Service Modeling</td>
<td>• Type: true</td>
</tr>
<tr>
<td>sa.service_modeling.use</td>
<td>• Default value: true</td>
</tr>
<tr>
<td>Enable verbose mode for identification engine</td>
<td>• Type: true</td>
</tr>
<tr>
<td>sa.identification_engine.verbose</td>
<td>• Default value: false</td>
</tr>
<tr>
<td>Enable limitation of application service maps drawing by number of nodes and edges.</td>
<td>Limit the number of nodes and edges on application service maps.</td>
</tr>
<tr>
<td>sa.map.LIMIT_MAX_GRAPH_SIZE</td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td></td>
<td>Setting this property to false may reduce performance in maps of large services.</td>
</tr>
<tr>
<td>Maximal number of displayable nodes on application service map. Maps with larger values will not be displayed.</td>
<td>The max number of nodes displayed on an application service map. If the number of nodes exceeds the specified number, the map does not appear and an error message appears.</td>
</tr>
<tr>
<td>sa.map.MAX_NODES_FOR_LAYOUT</td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 5000</td>
</tr>
<tr>
<td>Global flag to allow or disable spanning tree view for maps. true (default) - allows but not forces spanning tree view on maps.</td>
<td>Enable spanning tree view for application service maps.</td>
</tr>
<tr>
<td>sa.map.ALLOW_SPANNING_TREE_VIEW</td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td>Maximal number of displayable edges on application service map before spanning tree view applied.</td>
<td>The max number of edges displayed on an application service map, before applying spanning tree view.</td>
</tr>
<tr>
<td>sa.map.MAX_EDGES_FOR_FULL_LAYOUT</td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 1000</td>
</tr>
<tr>
<td>Property</td>
<td>Usage</td>
</tr>
<tr>
<td>----------</td>
<td>-------</td>
</tr>
</tbody>
</table>
| Maximal number of displayable edges on application service map. Maps with larger values will not be displayed. sa.map.MAX_EDGES_FOR_LAYOUT | Max number of edges displayed on an application service map. If the number of edges exceeds the specified number, the map does not appear and an error message appears.  
- Type: integer  
- Default value: 100000  
Increasing the default value may reduce performance in maps for large services. |
| Maximal degree of node on application service map for large map mode. Maps with smaller degrees will be displayed in regular mode. Maps with larger degrees will apply more edges merging for more compact view. sa.map.LIMIT_GRAPH_DEGREE |  
- Type: integer  
- Default value: 1000  
Increasing the default value may reduce performance in maps for large services. |
| Limit of amount of services that displayed on Services Tree on maps. Then this limit reached, Services Tree will be blocked. sa.service_tree.MAX_ITEMS_TO_DISPLAY |  
- Type: integer  
- Default value: 7000 |
| Maximal amount of connection properties to be shown at once when connection line selected on service map. If selected line contains more connections than defined here, then properties panel will have notification about cut-off connections. sa.map.max_connections_in_properties_panel |  
- Type: integer  
- Default value: 50 |
| Enable grouping of CIs on map. sa.map.enable_auto_grouping |  
- Type: true|false  
- Default value: true |
| Minimal number of CIs on a map to apply CI grouping. Relevant only if CI grouping is enabled on the map. The following CIs are not counted: discovered clusters, internal CIs inside inclusion boxes, entry points, error nodes, host CIs or CIs that are not hosted on other CIs. sa.map.min_nodes_for_auto_grouping |  
- Type: integer  
- Default value: 10 |
| Render full labels on CIs on map. Applicable to all CI labels (CI name, host name, cluster label, etc.) Enabling this will disable labels truncation, and labels will most probably overlap with other map elements. Not applicable to network/storage path maps. sncCommonMap.RENDER_FULL_LABELS | The default value of disabled, means none.  
- Type: choice list  
- Default value: Disabled  
- Other possible values:  
  - Exported PDF only: pdf  
  - Map and PDF views: all |
<table>
<thead>
<tr>
<th>Property</th>
<th>Usage</th>
</tr>
</thead>
</table>
| Maximal width of CI node labels in pixels. Relevant for any kind of labels (CI name, host name, cluster label etc.) This size also modifies horizontal space between CI elements. Applied to map view and exported PDF view. Not applicable to network/storage path maps. | - Type: integer  
- Default value: 95  
- Other possible values:  
  - Min value: 20  
  - Max value: 1000 |

sncCommonMap.NODE_LABEL_WIDTH

| Identification Engine Logging: Identification Engine severity level | Type: choice list  
- Default value: Debug  
- Other possible values:  
  - Info  
  - Warn  
  - Error  
  - DebugVerbose  
  - DebugObnoxious  

Learn more: Examine identification engine run logs on page 138 |

sa.ie.log.ie_severity_level

| Identification Engine Logging: Service cache severity level | Type: choice list  
- Default value: debug  
- Other possible values:  
  - Info  
  - Warn  
  - Error  
  - DebugVerbose  
  - DebugObnoxious  

Learn more: Examine identification engine run logs on page 138 |

sa.ie.log.service_cache_severity_level

---

**View CMDB benchmarks**

CMDB calculates several CMDB Health benchmarks which then display in the Benchmarks dashboard. These benchmarks are based on various CMDB Health metrics, displaying monthly averages, trends, comparisons to industry averages of your ServiceNow peers, and global benchmarks.

The CMDB Health Dashboard jobs must be enabled and health data must be collected. Also, navigate to Benchmarks Setup and ensure that the CMDB KPIs are enabled under IT Operations Management.

CMDB provides the following benchmarks:

- % of non-compliant CIs
- % of duplicate CIs
- % of stale CIs

For an instance, each of these benchmarks is the calculated monthly average for the corresponding CMDB Health metric. Calculating a monthly average requires that there is a metric result value for each day of the
month. Therefore, each day on which the respective Health Dashboard job did not run, is assumed with the aggregated result from the run that is most recent to that day. The monthly average is then calculated based on the sum of all the daily aggregated results for the metric in that month, divided by the number of days of the month. For a CMDB Health Dashboard job that ran multiple times in a single day, only the results of the last run in that day are used for the monthly average calculation.

---

**Note:** The frequency of CMDB Health Dashboard job executions depend on whether the job is enabled, its schedule and on manual runs.

Global averages are based on the sum of monthly averages of all peer instances, divided by the number of instances (aside from instances for which the monthly average is 0).

1. Navigate to **Benchmarks Dashboard**.
2. Click the **** icon and select **IT Operations Management**.
3. Click **ALL** or **CMDB**.
4. Click on a **CMDB benchmark** to drill down to trend data, and other benchmark details.

---

**CMDB APIs (CMDB SDK)**

Use CMDB APIs to create, update, and read operations on the CMDB. Domain separation is supported in CMDB APIs.

---

**CMDB APIs (CMDB SDK)**

Use the following CMDB APIs to create, update, and read operations on the CMDB:

- **CMDBGroupAPI**
- **CMDBTransformUtil**
- **CMDBUtil**
- **IdentificationEngineScriptableApi**
- **IdentificationEngine**

---

**Domain separation in CMDB APIs**

Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.

Domain separation is supported in this application. Not all ServiceNow applications support domain separation; some include limitations on the data and administrative settings that can be domain separated. To learn more, see [Application support for domain separation](#).

CMDB APIs are used for accessing the CMDB from a script. CMDB stores the CI and relation information; CMDB is domain separated.

CMDB APIs support the following operations:

- Create a new CI
• This operation goes through the Identification and Reconciliation Engine which supports domain separation when creating a CI. The domain of the caller is used for this operation.

• Update an existing CI
  • This operation goes through the Identification and Reconciliation Engine which supports domain separation when creating a CI. The domain of the caller is used for this operation.

• Create/Delete relations
  • The cmdb_rel_ci table is not domain separated.

• Query CMDB CI/Query CMDB table
  • Results are filtered by the domain(s) visible to the caller.

• Query CMDB metadata table
  • Metadata information is not domain separated.

Setting up domain separation for CMDB APIs

If domain separation is enabled for CMDB, then it is also available for CMDB APIs.

Data separation

Data is stored and domain separated in CMDB. There is no additional work needed from the CMDB API perspective.

Configuring a domain-separated environment

The configuration is done at the CMDB level.

If a domain column is present for base system application tables

See the Domain separation in CMDB Health on page 149 topic.

Tenant domains and application data

There is no application-specific data to manage with CMDB.

Useful related lists in CI forms

By default, the forms that display manageable configuration items (CI) - computers, printers, network gear, uninterruptible power supplies (UPS), and power distribution units (PDU) - provide a number of related lists for the form.
The following related lists are common to all forms for manageable CIs.

- Network Adapters - Displays all the NICs installed on a CI.
- CI IPs - Displays all the IP addresses on this CI:
  - Computers (workstations, laptops using various Mac and Windows operating systems)
  - Windows servers
  - Linux servers
  - AIX servers
  - Solaris servers
  - Devices discovered through SNMP.
- DNS Names for CIs - Displays all the DNS names on a CI.

The IP version information appears in all IP address related lists and forms.

**Note:** Since all paths here click into the IP Address to DNS Names list that associates an IP address with a DNS name, this part of the common flow was not added to the tree structure.

**Discovery source**

A table called Source [sys_object_source] stores information identifying the source of a discovery (by ServiceNow Discovery or another product), the ID of that source, and the date/time of the last scan. To view this information, configure a CI form and add the Sources related list. This table is populated automatically when the *Discovery plugin* is enabled.

**Activate the Extended CMDB plugins**

The Configuration Management (CMDB) application provides core functionality for the configuration management database, including modules for hardware and configuration items. The separate Extended CMDB plugin includes a collection of modules for specialized configuration items, such as radio hardware, test equipment, and voice system hardware.

Role required: admin

The Configuration Management (CMDB) plugin is automatically active for all instances. You must activate related plugins to access the modules for specialized configuration items.

- CMDB Mainframe (com.snc.cmdb.mainframe)
- CMDB Radio Category (com.snc.cmdb.radio.category)
- CMDB Telecom Category (com.snc.cmdb.telecom.category)
- CMDB Test Equipment (com.snc.cmdb.test.equipment)

1. Navigate to System Definition Plugins.
2. Right-click the plugin name on the list and select Activate/Upgrade.
   If the plugin depends on other plugins, these plugins and their activation status are listed.
3. Select the Load demo data check box.
   Some plugins include demo data—sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good policy when first activating the plugin on a development or test instance. You can load demo data after the plugin is activated by repeating this process and selecting the check box.
4. Click Activate.
Help the Help Desk

Help the Help Desk is a tool that allows users to populate the CMDB automatically with information about their Windows computer.

Help the Help Desk is a small web application that downloads and runs locally, using a WMI login script to gather information such as serial number, computer name, disk configuration, network configuration, installed software, memory, and much more. Users have the option of using two types of SOAP authentication for running the Help the Help Desk script.

- **Cookie-based authentication for Help the Help Desk** on page 224
- **Basic access authentication for Help the Help Desk** on page 226

**Note:** Domain separation is not supported for Help the Help Desk.

User roles and user names

Users must have the soap_ecc role to use Help the Help Desk from within an instance.

For users without access to an instance, you can configure Help the Help Desk to allow users to **run the script without login credentials**. Users with access to an instance can also use Help the Help Desk configured in this way, but only if they have the soap_ecc role.

User name cannot contain these characters: \

Any user name that contains the \n characters prevents the Assigned to field on a computer from being populated.

Help the Help Desk device identification

Help the Help Desk uses a predefined series of queries to identify and update existing CIs in the CMDB or to create a new CI if no match is found. These queries attempt to match devices using three criteria in a certain order.

Updates to an existing CI require only a single match as the list is evaluated. For example, if a device's name has changed, but the MAC address is the same, the CI with the matching MAC address is updated.

- Serial number in the [cmdb_ci_computer] table
- MAC address in the [cmdb_ci_network_adapter] table
- Computer name in the [cmdb_ci_computer] table

**Note:** Discovery Identifiers are incompatible with Help the Help Desk queries.

Script include

The script include CIIdentifierForHelpDesk provides the logic for updating existing CIs or creating a new CI if no matching device exists in the CMDB. Do not modify this script. Errors introduced into this script can result in update failures or in new CIs being created for every device found.
Configure SOAP authentication for Help the Help Desk

By default, the ServiceNow system requires SOAP authentication. This affects the way in which your browser is configured for Help the Help Desk.

Role required: admin

1. Navigate to System Properties Web Services.
2. Verify the system property for Require basic authorization for incoming SOAP requests glide.basicauth.required.soap is enabled.
3. Click Save.

Note:
If you receive the error, There was a problem retrieving the XML data(0): Unknown, an authentication issue is preventing the script from sending information to your ServiceNow instance. Verify the user meets the requirements for Cookie-based authentication for Help the Help Desk on page 224 or Basic access authentication for Help the Help Desk on page 226.

Cookie-based authentication for Help the Help Desk

Cookie-based authentication uses cookies generated by Windows Internet Explorer for SOAP authentication on the instance.

This type of authentication can be used to run the Help the Help Desk script at the time it is downloaded or after it has been saved to the local drive. When the script is downloaded, Internet Explorer generates a cookie using the user’s login credentials, and then shares this cookie with the script. When a user attempts to run the script, the instance checks first for this cookie. If the cookie has been created, the script can authenticate on the instance through SOAP.
The following setup requirements are imposed on .hta file downloads by Microsoft.

- You must use Internet Explorer and choose to run the script while you are logged in to your instance. If you choose to use a different browser and download the script file to run later, the script will not work properly unless you have an active session on your instance with Internet Explorer.
- Disable Protected Mode and User Account Control (UAC). Protected Mode is available in Internet Explorer 7 or later in Windows Vista. UAC is a feature of Windows Vista and Windows 7.
- This feature requires that your logged in user session be persisted to the Help the Help Desk script. For this to occur, the Remember me check box in the login screen must be enabled and selected (the...
default behavior). This option enables the system to write back an HTTP cookie to your browser to be persisted across sessions.

Basic access authentication for Help the Help Desk

An alternative to cookie-based authentication for the Help the Help Desk script is basic access authentication, which employs two properties to configure the script with credentials.

When a user logs in with the proper credentials, that user accesses the instance in the soap_ecc role, which grants access to the ECC queue but limits the user's access to other features. The administrator then configures the system properties with the user name and password for the soap_ecc user.

The values from these properties are automatically saved to the script file helpthehelpdesk.js. When this user runs the Help the Help Desk script, the instance checks for a cookie. If no cookie is found, the instance checks for the login credentials provided by the system properties, and authenticates the script automatically.

Set up basic access authentication for the Help the Help Desk script

You can set up basic access authentication for the Help the Help Desk script.

Role required: admin

1. Create a new user with the following values.

<table>
<thead>
<tr>
<th>User ID</th>
<th>Create an easily recognizable user name such as SOAPAUTH or SOAPONLY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>First name</td>
<td>SOAP</td>
</tr>
<tr>
<td>Last name</td>
<td>Authentication</td>
</tr>
<tr>
<td>Password</td>
<td>Any password</td>
</tr>
</tbody>
</table>

2. Right-click the header bar and select Save.
   The record is saved, and the Related Lists appear.

3. In the Roles Related List, click Edit.

4. In the slushbucket, move the soap_ecc role from the Collection list to the Roles list, and then click Save.

5. Navigate to System Definition Help the Help Desk.

6. Add the user name and password you created to the appropriate properties, and then click Save.
   The password is encoded when saved.

   The login credentials from these properties are saved to the helpthehelpdesk.js script. When the Help the Help Desk script is run by a user logged in with these credentials (in the soap_ecc role), the script is able to authenticate automatically on the instance.

Help the Help Desk login script

The Help the Help Desk script enables organizations to proactively scan their network to discover all Windows based hardware and the software packages installed on those devices.

This WMI-based script is included in the core ServiceNow platform functionality. This script also can be set up to run as a Windows login script and used to keep the CMDB up to date. The script is named helpthehelpdesk.js and can be downloaded from each customer's local instance.
Install and use the login script

The login script is installed on the instance and can be downloaded directly from a module.

Role required: admin

The same script is used to perform the Help the Help Desk scan, which gathers information about a user’s Windows computer and updates the CMDB.

1. Log in to your instance with Windows Internet Explorer.
2. Navigate to System DefinitionHelp the Help Desk Login Script.
3. Follow the download instructions in the page that appears.
4. Put the helpthehelpdesk.js file in the following folder: %SystemRoot%\sysvol\sysvol\<domain DNS name>\scripts where %SystemRoot% is usually c:\winnt or c:\WINDOWS and <domain DNS name> is the DNS name of the domain, similar to MyDomain.com. This folder is replicated to all domain controllers in the domain.
5. Open the helpthehelpdesk.js file in a text editor, such as Wordpad.
6. Check the var server line to ensure that the URL for your ServiceNow instance is correct. The name of the instance is added automatically. It should look something like this:

```javascript
var server = "https://abctech.service-now.com/";
```

7. Ensure that basic authorization for SOAP requests is enabled in your instance, and a SOAP user is defined.

This allows the script to connect to your instance. The entry should look something like this:

```javascript
var httpUsername = "user_on_your_instance";
var httpPassword = "user's_password";
```

8. Create a Logon.bat script to run helpthehelpdesk.js as follows.

```bash
@echo off
cscript %0\..\helpthehelpdesk.js
EXIT
```

9. Add Logon.bat to the Logon script field on the Profile tab of the user properties dialog in the Active Directory Users and Computers MMC corresponds to the scriptPath attribute of the user object.

Logon scripts can also be configured in Group Policy. However, Group Policy only applies to clients with Windows 2000 or above. The setting in Group Policy is User Configuration, Windows Settings, Scripts (Logon/Logoff), Logon. Copy the file you want for the Logon script to the Windows clipboard.

10. Open the Logon setting in the Group Policy editor.
11. Click the Show Files button.
12. Paste the desired file in the dialog. You can select the file and edit it in this dialog as well. This is easier than navigating in Windows Explorer to the folder where Group Policy Logon scripts are saved. However, if you do have to navigate to the folder, the path on the domain controller is:

```
%SystemRoot%\sysvol\sysvol\<domain DNS name>\<policy GUID>\user\scripts\logon
```

Again, %SystemRoot% is usually c:\\winnt and <domain DNS name> is the DNS name of the domain, similar to MyDomain.com.

<policy GUID> is a hexadecimal string representing the GUID (unique identifier) of the specific Group Policy Object (GPO). Group Policies are assigned to a domain, site, or organizational unit in Active Directory.

The logon script setting applies to all users in the domain, site, or organizational unit to which the GPO applies. You will notice that you assign a logon script to all users in the container at once, rather than having to assign the scriptPath attribute for each user. This makes it much easier to assign logon scripts to many users. However, since the same Group Policy applies to all users in the domain, site, or organizational unit, you must code the logon script to accommodate all users.

Encode the Help the Help Desk password

You can use the Help the Help Desk properties to encode the password with simple base64 encoding.

Role required: admin

Configure the user name and encode the password in the properties before downloading the script. This adds the encoded password directly to the script without any further configuration.

1. Navigate to System DefinitionHelp the Help Desk .
2. Enter a user name and password into the properties for SOAP authentication.
3. Click Save.

![Image: Please edit your changes and press Save]

Customization Properties for Help The Help Desk

```
SOAP authentication username for Help The Help Desk script.
sncuser

SOAP authentication password for Help The Help Desk script.
encrypt:cGFzc3dvcmQ=
```

The password is encoded immediately.

4. Navigate to System DefinitionHelp the Help Desk Login Script
5. Download the script.
The script downloads with the encoded password in place. If you download the script before encoding the password in the properties form, you must add the variable and encoded password manually.

Run the Help the Help Desk script

You can run the Help the Help Desk script manually.

You also can configure Help the Help Desk to run automatically when users log into their computer. For more details, see Help the Help Desk login script on page 226.

1. On your instance, navigate to Self Service Help the Help Desk.
2. Click Start the Scan to Help the Help Desk.
You are prompted to run or save the discovery.hta script.
3. Run or save the discovery.hta script.
   • If your browser is Windows Internet Explorer, run the script.
   • If you are using any other browser, click Save and save the script to the local machine. To execute the saved script, double-click the file.

The script runs a series of WMI queries to gather information about the Windows machine. When it is finished, the data is sent back to your instance and is used to populate the configuration database (CMDB).

The error message Error: Unable to parse SOAP document means that the Help the Help Desk script was unable to connect to the instance to relay the information that was discovered.

Run the discovery.hta script with browsers other than Internet Explorer

You can run the discovery.hta script with browsers other than Internet Explorer.

Browsers other than IE cannot handle files with the .hta extension. Browsers like Firefox, Safari, and Opera prompt users to download the script file, which you can then double-click to run.

However, in Windows XP (including Vista, Windows 2003 Server, and later), files downloaded from the Internet are marked with a security restriction that interferes with running the script. The typical error message introduced by this security restriction looks like this:

eccEvent(): Access Denied
To remove the security lock on the downloaded file, complete the following steps.

1. Right-click on the downloaded file and select Properties.
   The following message is displayed on the bottom of the form:
   This file came from another computer and may be blocked to protect this computer.
2. Click Unblock to remove the security restriction.
   The script will run if SOAP authentication is disabled.

Access Help the Help Desk status

Help the Help Desk displays the status of all scans in daily records. Drill down into a record for details on how the CMDB was updated within the last 24 hours from scans performed on the instance.

Role required: admin

1. Navigate to System Definition Help the Help Desk Status.
   A new status record is created each day and displays the number of scans completed (devices scanned). The Description field shows Help the help desk as the source of the scan.

2. To view the details of individual scans, open a scan record.
3. In the scan record, select the Devices tab to view all the devices scanned by Help the Help Desk that day.
   Each CI displays the device class and the activity completed: Created CI or Updated CI. By default, Help the Help Desk cannot discriminate class between servers and workstations and classifies each CI as a Computer. However, if Discovery is activated on the instance, Help the Help Desk can classify CIs as either Windows servers or computers.
4. Select the ECC Queue tab to examine the data payload returned from each scan.

If Discovery is active on the instance, the Help the Help Desk status appears in the Discovery Status record list. These scan records are described as Help the help desk in the list to differentiate them from regular discoveries run from a schedule or a UI action. Open the status record to access the forms described in this page.
Determine values for the Assigned to field

This page explains how to set properties to determine which value appears in the Assigned to field when the script is run.

Role required: admin

Any user name that contains the \n characters prevents the Assigned to field on a computer from being populated.

- Navigate to System Definition Help the Help Desk.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.wmi.assigned_to_always_overwrite</td>
<td>If the Help the Help Desk script is run on the same computer by different users, the platform overwrites the user name in the Assigned to field each time the script is run. To prevent this, set the For Help the Help Desk script, if the property is &quot;yes&quot;, the &quot;assigned_to&quot; field of the CI is always overwritten; otherwise the field is not overwritten unless it is empty [glide.wmi.assigned_to_always_overwrite] property to false (clear the check box).</td>
</tr>
</tbody>
</table>

| glide.discovery.assigned_user_match_field | Help the Help Desk attempts to match a Windows user name it finds with the the user_name field of the User [sys_user] table. However, this might not be desirable if the user_name field from the User [sys_user] table contains formatting that is different from that found in Windows. The For Discovery and Help the Help Desk, the following field in the sys_user table is used to associate a computer CI with a user [glide.discovery.assigned_user_match_field] property enables you to select an alternative field for matching. For example, you can create a field called u_username, and then populate it with a user ID that can be matched against the Windows user name. In this case, replace the default value in the property with u_username. |

View scan results

You can view the results of Help the Help Desk scans on an instance.

Role required: admin

These records provide access to logs, CI records, and the ECC Queue for all scans conducted each day. Help the Help Desk status reports are also accessible from the Discovery list.

1. Navigate to System Definition Help the Help Desk Status.
2. Open the daily status record.
Help the Help Desk script troubleshooting

With the Help the Help Desk script, you can detect all system software on a 64-bit machine. You can also configure the Help the Help Desk script to run for users without prompting for a user name and password.

Allow users without a ServiceNow instance login to run Help the Help Desk script

You can configure the Help the Help Desk script to run for users without prompting for a user name and password.

Role required: admin

This setup enables users who do not have access privileges to an instance to run the script on their Windows machines without having to provide a user name and password. The script can be configured to login in automatically as a SOAP user with the soap_ecc role.

1. Log in to your instance with Windows Internet Explorer.
2. Navigate to System Definition Help the Help Desk Login Script .
3. Follow the download instructions in the page that appears.
4. Put the helpthehelpdesk.js file in the following folder: %SystemRoot%\sysvol\sysvol\<domain DNS name>\scripts where %SystemRoot% is usually c:\winnt or c:\WINDOWS and <domain DNS name> is the DNS name of the domain, similar to MyDomain.com. This folder is replicated to all domain controllers in the domain.
5. Open the helpthehelpdesk.js file in a text editor, such as Wordpad.
6. Check the var server line to ensure that the URL for your ServiceNow instance is correct.

The name of the instance is added automatically. It should look something like this: var server = "https://abctech.service-now.com/"

```
/* ************** Required Variables ******************
 * The following section should be modified if the information is not correct.
 * *************************************************************

// The variable should point to your instance URL, such as http://demo.service-now.com
var server = "https://abctech.service-now.com/";

// If SOAP authentication is turned on on the instance. The http authentication should be provided here
var httpUsername = "";
var httpPassword = "";

/* ************** Optional Variables ******************
 * The following section can be modified for other purposes.
 * *************************************************************
```

7. Ensure that basic authorization for SOAP requests is enabled in your instance and a SOAP user is defined.

This allows the script to connect to your instance. The entry should look something like this:

```javascript
var httpUsername = "user_on_your_instance";
var httpPassword = "user's_password";
```

8. Make the script file available to all users.

Detect software on 64-bit systems with Help the Help Desk

You can detect all system software successfully on a 64-bit machine.
A 64-bit browser can detect both 64-bit and 32-bit software, but a 32-bit browser cannot detect 64-bit software.

- To detect all system software, run the Help the Help Desk script from a 64-bit browser.

Table form views

When you view a table definition form, you can open the context menu, and select a form view in which to display the table. The default view for a table is the Default view. For any class that is an extension of the CMDB table, you can select the CI Definition view which provides additional access to related tables and information.

The CI Definition form view is a centralized location from which you can configure and view a table. In addition to the information that the default view displays, the CI Definition form view provides the following controls,

<table>
<thead>
<tr>
<th>Control</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Icon tab</td>
<td>View and create new NG-BSM icons for CI types</td>
</tr>
<tr>
<td>CI Identifier tab</td>
<td>View and create new CI identifiers</td>
</tr>
<tr>
<td>Reconciliation Definitions tab</td>
<td>View and create new data source definitions</td>
</tr>
<tr>
<td>Inclusion related link</td>
<td>Links to the Metadata Editor</td>
</tr>
</tbody>
</table>

To access these additional controls on the CI Definition form view, you need to first create a new table that is derived from the CMDB table, and then view it using the CI Definition form.

Out-of-the-box Configuration Management (CMDB) Performance Analytics Solutions

Solutions contain preconfigured dashboards. These dashboards contain actionable data visualizations that help you improve your business processes and practices.

**Note:** You can activate Performance Analytics solutions and in-form analytics on instances that have not licensed Performance Analytics to evaluate the functionality. However, to start collecting data you must license Performance Analytics.

Solutions

Use the Performance Analytics widgets on the dashboard to visualize data over time, analyze your business processes, and identify areas of improvement. With solutions, you can get value from Performance Analytics for your application with minimal setup.

**Note:** Solutions include some dashboards that are inactive by default. You can activate these dashboards to make them visible to end users according to your business needs.

To enable the solutions for Configuration Management (CMDB), an admin can navigate to Performance Analytics Guided Setup. Click Get Started then scroll to the section for Configuration Management (CMDB). The guided setup takes you through the entire setup and configuration process.
Dependency Views

ServiceNow® Dependency Views graphically displays an infrastructure view for a configuration item (CI) and the application or business services that it is part of and that it supports. Dependency Views indicates the status of its configuration items, and allows access to CIs related alerts, incidents, problems, changes, and services.

If Service Mapping is activated, Dependency Views maps are enhanced to display dependencies that reflect connections in service maps.

Explore
• Upgrade to London
• Domain separation and Dependency Views on page 240

Administer
• Create or modify map indicators on page 255
• Create or modify map icons on page 258
• Create a predefined filter on page 259
• Create or modify Map Related Items on page 260
• Create or modify Dependency Views menu actions on page 262
• Create or edit a dependency type on page 265

Use
• Dependency Views map on page 240
• Dependency Views map menus and controls on page 241
• View a Dependency Views map on page 250
• Change the layout of Dependency Views map on page 251
• Filter the view of a Dependency Views map on page 251
• Perform actions on nodes in a Dependency Views map on page 253
• Supported browsers for Dependency Views on page 239

Develop
• Developer training
• Developer documentation
• Components installed with Dependency Views on page 235

Integration
• Display metrics for CIs in a Dependency Views map on page 253

Troubleshoot and get help
• Ask or answer questions in the ServiceNow Community
• Search the HI knowledge base for known error articles
• Contact ServiceNow Support

Components installed with Dependency Views

Several types of components are installed with activation of the Next_Gen BSM (com.snc.ng_bsm) plugin, including tables and properties.

Note: To view all other components installed with this plugin, see the Application Files table. For instructions, see Find components installed with an application.
## Tables installed

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available CI icons</td>
<td>Stores all available CI class icons.</td>
</tr>
<tr>
<td>[ngbsm_ci_icons]</td>
<td></td>
</tr>
<tr>
<td>Icons for CI types</td>
<td>Maps icons to CI class names.</td>
</tr>
<tr>
<td>[ngbsm_ci_type_icon]</td>
<td></td>
</tr>
<tr>
<td>Map Script</td>
<td>Custom scripts that run in real time and generate a custom view of a map for a specific CI.</td>
</tr>
<tr>
<td>[ngbsm_script]</td>
<td></td>
</tr>
<tr>
<td>Map View</td>
<td>Serialized map views saved by users.</td>
</tr>
<tr>
<td>[ngbsm_view]</td>
<td></td>
</tr>
<tr>
<td>Map Filter</td>
<td>Filters saved by users.</td>
</tr>
<tr>
<td>[ngbsm_filter]</td>
<td></td>
</tr>
<tr>
<td>Menu Action</td>
<td>Default and custom context menu actions that appear when users right click a map.</td>
</tr>
<tr>
<td>[ngbsm_context_menu]</td>
<td></td>
</tr>
<tr>
<td>Related Item</td>
<td>Stores which reference fields should be treated as relationships when building the map. This allows users to include CIs that are related via a reference field instead of a relationship.</td>
</tr>
<tr>
<td>[ngbsm_related_item]</td>
<td></td>
</tr>
<tr>
<td>Edge Colors</td>
<td>Color definitions to use when drawing the relationships between nodes based on relationship type.</td>
</tr>
<tr>
<td>[bsm_edge_color]</td>
<td></td>
</tr>
<tr>
<td>Map Indicator</td>
<td>Stores all map indicators.</td>
</tr>
<tr>
<td>[bsm_indicator]</td>
<td></td>
</tr>
<tr>
<td>BSM Saved Map</td>
<td>Details of maps.</td>
</tr>
<tr>
<td>[bsm_graph]</td>
<td></td>
</tr>
<tr>
<td>BSM Map Actions</td>
<td>Actions on the map.</td>
</tr>
<tr>
<td>[bsm_action]</td>
<td></td>
</tr>
<tr>
<td>BSM Map View</td>
<td>Parents' predefined filters.</td>
</tr>
<tr>
<td>[map_view]</td>
<td></td>
</tr>
<tr>
<td>Map View Configuration Types</td>
<td>Configuration type filters, limiting the CI class types to be displayed, per predefined filter.</td>
</tr>
<tr>
<td>[map_view_ci_type]</td>
<td></td>
</tr>
<tr>
<td>Map View Relationship Types</td>
<td>Relationship type filters, limiting the links to be displayed between CIs, per each predefined filter.</td>
</tr>
<tr>
<td>[map_view_rel_type]</td>
<td></td>
</tr>
<tr>
<td>[map_viewroles]</td>
<td>Roles that a specific predefined filter should be applied to.</td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
</tr>
<tr>
<td>CI Filters</td>
<td>CI attribute filters, limiting the CIs to be displayed, per predefined filter.</td>
</tr>
</tbody>
</table>

### Properties installed

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum number of CIs to display on a map at once</td>
<td>The maximum number of nodes to retrieve from the database. If more nodes exist in the database, they are not displayed in the map.</td>
</tr>
<tr>
<td>glide.bsm.max_nodes</td>
<td></td>
</tr>
<tr>
<td>• Type: Integer</td>
<td></td>
</tr>
<tr>
<td>• Default value: 1000</td>
<td></td>
</tr>
<tr>
<td>• Location: Dependency Views Map Properties</td>
<td></td>
</tr>
<tr>
<td>Maximum level depth from the root CI that can be initially displayed in Dependency Views. Range is 1 to 49</td>
<td>Level depth is the graph distance between the root CI and a node.</td>
</tr>
<tr>
<td>glide.bsm.max_levels</td>
<td></td>
</tr>
<tr>
<td>• Type: Integer</td>
<td></td>
</tr>
<tr>
<td>• Default value: 3</td>
<td></td>
</tr>
<tr>
<td>• Other possible values: 1-49</td>
<td></td>
</tr>
<tr>
<td>• Location: Dependency Views Map Properties</td>
<td></td>
</tr>
<tr>
<td>Show children of virtual groups</td>
<td>Display the continuation of the map underneath virtual group. Virtual links are used to connect virtual groups to their child nodes.</td>
</tr>
<tr>
<td>glide.bsm.show_virtual_node_children</td>
<td></td>
</tr>
<tr>
<td>• Type: Yes</td>
<td>No</td>
</tr>
<tr>
<td>• Default value: No</td>
<td></td>
</tr>
<tr>
<td>• Location: Dependency Views Map Properties</td>
<td></td>
</tr>
<tr>
<td>Maximum number of child nodes to display (the rest will be collapsed)</td>
<td>Maximum number of nodes (of a similar CI type and at the same level) to display before applying virtual grouping. Nodes are collapsed for the map to meet this limit.</td>
</tr>
<tr>
<td>glide.bsm.too_many_children</td>
<td></td>
</tr>
<tr>
<td>• Type: Integer, valid values 1 or greater</td>
<td></td>
</tr>
<tr>
<td>• Default value: 10</td>
<td></td>
</tr>
<tr>
<td>• Location: Dependency Views Map Properties</td>
<td></td>
</tr>
<tr>
<td>A value of true indicates that filtered out items will be removed from the graph along with any disconnected children while a value of false indicates that the items will be dimmed in color</td>
<td></td>
</tr>
<tr>
<td>glide.ngbsm.filters_remove_filtered_items</td>
<td></td>
</tr>
<tr>
<td>• Type: Yes</td>
<td>No</td>
</tr>
<tr>
<td>• Default value: Yes</td>
<td></td>
</tr>
<tr>
<td>• Location: Dependency Views Map Properties</td>
<td></td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| glide.bsm.max_num_rels | The maximum number of relations to retrieve from the database. If more relations exist in the database, they are not displayed in the map.  
- Type: Integer, valid values 1 or greater  
- Default value: 100  
- Location: Dependency Views Map Properties |
| glide.ngbsm.filters_run_layout_automatically | A value of true indicates that when filters are changed the graph will recalculate it's layout using the currently selected layout algorithm  
- Type: Yes | No  
- Default value: Yes  
- Location: Dependency Views Map Properties |
| glide.ngbsm.filters_fit_to_screen_automatically | A value of true indicates that when filters are changed the graph will be fit to the screen automatically  
- Type: Yes | No  
- Default value: No  
- Location: Dependency Views Map Properties |
| glide.ngbsm.performance_allow_curves | A value of true allows relationship lines to be drawn using smooth curves instead of straight line segments. These curves can be more taxing on the browser, setting to false may improve fluidity of animation and interaction for Dependency Views  
- Type: Yes | No  
- Default value: Yes  
- Location: Dependency Views Map Properties |
| glide.ngbsm.notification_display_time | Amount of time in milliseconds a notification stays on the screen  
- Type: Integer  
- Default value: 5000  
- Location: Dependency Views Map Properties |
| glide.ngbsm.search_ci_limit | The maximum amount of results displayed when searching for CIs  
- Type: Integer  
- Default value: 10  
- Location: Dependency Views Map Properties |
| glide.ngbsm.search_rel_type_limit | The maximum amount of results displayed when searching for Relationship Types  
- Type: Integer  
- Default value: 5  
- Location: Dependency Views Map Properties |
| glide.ngbsm.show_class_labels | When available, the map should display the class labels for each CI  
- Type: Yes | No  
- Default value: Yes  
- Location: Dependency Views Map Properties |
<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
</table>
| Truncate node labels to a single line and to fit available space (default). Disable to display entire labels on multiple lines and wrapped as needed glide.ngbsm.truncate_long_labels | If glide.ngbsm.show_class_labels is enabled, then the class label always displays on top of the CI label, and wrapping applies to both the class and the CI labels.  
  - Type: Yes | No  
  - Default value: No  
  - Location: Dependency Views Map Properties |
| Minimum horizontal distance between nodes in horizontal layout glide.bsm.layout_horizontal_spacing_x | The distance is measured in pixels between one node's center to another node's center.  
  - Type: Integer  
  - Default value: 200  
  - Location: Dependency Views Map Properties |
| Minimum vertical distance between nodes in horizontal layout glide.bsm.layout_horizontal_spacing_y | The distance is measured in pixels between one node's center to another node's center.  
  - Type: Integer  
  - Default value: 100  
  - Location: Dependency Views Map Properties |
| Minimum horizontal distance between nodes in vertical layout glide.bsm.layout_vertical_spacing_x | The distance is measured in pixels between one node's center to another node's center.  
  - Type: Integer  
  - Default value: 125  
  - Location: Dependency Views Map Properties |
| Minimum vertical distance between nodes in vertical layout glide.bsm.layout_vertical_spacing_y | The distance is measured in pixels between one node's center to another node's center.  
  - Type: Integer  
  - Default value: 125  
  - Location: Dependency Views Map Properties |

**Supported browsers for Dependency Views**

The latest version or service pack of internet browsers are required to view and manipulate Dependency Views maps.

The Dependency Views module supports the latest version or service pack of the following browsers:

- Firefox with the latest ESR
- Chrome latest version
- Safari version 8 or later (latest is recommended)
- Microsoft Internet Explorer (IE) version 11 and Microsoft Edge.

The Dependency Views module is not supported on tablets and on mobile devices.
Domain separation and Dependency Views

This is an overview of domain separation in Dependency Views. Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.

Overview

Support: Level 1

Domain separation is supported in this application. Not all ServiceNow applications support domain separation; some include limitations on the data and administrative settings that can be domain separated. To learn more, see Application support for domain separation.

How domain separation works in Dependency Views

Dependency views are generated using both Configuration Item [cmdb_ci] and CI Relationship [cmdb_rel_ci] tables. The [cmdb_ci] table is domain separated, but the [cmdb_rel_ci] table is not. You can create relationships only by selecting two CIs. They should be in the same domain for you to be able to see them.

To be successful with domain separation in Dependency Views, make sure that relevant CIs are visible for the current domain. If the instance is domain separated, ServiceNow domain separation rules apply (see Related information link below).

Tenant domains will be able to see only their domain and global CIs.

Dependency Views map

ServiceNow® Dependency Views maps graphically display CIs that support application or business services and the relationships between the CIs.

A ServiceNow service (application service or business service) is work or goods that are supported by an IT infrastructure. For example, delivering email service to an employee can require services such as email servers, web servers, and the work to configure the user's account.

A Dependency Views map has one starting point, called the root CI or root node of the map. The root CI is surrounded by a darker frame that repaints itself with a pulsing effect drawing the attention to the root CI. The maps can show both upstream and downstream dependencies for the root CI. By default the Dependency Views map displays 3 levels, both upstream and downstream relationships. Administrators can configure the number of levels displayed. The map collapses and expands clusters to make them easier to view. By default, clusters are collapsed.

In a Dependency Views map, map indicators indicate if a CI has any active, pending issues. You can investigate the tasks that are connected to a CI to get more details. When you return to the map from another form, the system restores the last map viewed, using the default filter and layout settings. When you click the icon on a CI record or on a task record that identifies a CI, the map opens.

Many of the relationships in map are created through the discovery process. You can also create, define, and delete CI relationships in the map. You can display the map from different perspectives and open specific records that relate to configuration items. The system refreshes the map automatically to reflect changes to the CMDB.
Note: CIs not extended from the Configuration Item [cmdb_ci] table, are not displayed in Dependency Views maps and in CI relation formatters.

The Dependency Views module is active in all instances, and includes demo data.

Figure 15: Dependency Views sample map

When you click the map icon

[ ]
on a CI record or on a task record that identify a CI, a map opens.

Roles

Users with the itil and ecmdb_admin roles can view maps and perform all actions in the map. Actions include access to the map views and saved filters, both from the lists in the map and from the Saved Filters module.

Dependency Views map menus and controls

Dependency Views maps contain the following menus and controls.
## Map options

The following options are available across the top of the map.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;Root CI&gt;</td>
<td>Next to the menu icon is the name of the current root node (CI) of the map.</td>
</tr>
<tr>
<td>Menu</td>
<td>Menu to save, load and export views of the map.</td>
</tr>
<tr>
<td>Search for CI</td>
<td>Enter the name of a CI, application service, or business service to load into the map. Alternatively, you can start typing to have the auto-complete feature present a list of CIs and services that match your partial value.</td>
</tr>
<tr>
<td>Vertical</td>
<td>Display the map in vertical view.</td>
</tr>
<tr>
<td>Horizontal</td>
<td>Display the map in horizontal view.</td>
</tr>
<tr>
<td>Radial</td>
<td>Display the map in radial view.</td>
</tr>
<tr>
<td>Force</td>
<td>Centers the elements around the parent CI, regardless of upstream or downstream relationships.</td>
</tr>
<tr>
<td>Group</td>
<td>Groups the elements according to their CI type.</td>
</tr>
<tr>
<td>Details</td>
<td>Displays related lists such as Problems, Changes and Related Services that are associated with the selected CI. • Click a service to highlight the CIs that are associated with that service. • Click Related Services, then double-click a service to display the map in the Event Management dashboard.</td>
</tr>
<tr>
<td>Settings</td>
<td>Set filters for the map.</td>
</tr>
</tbody>
</table>

If the Event Management plugin is active, then events and alerts are also displayed.
Use the navigation tools to increase or decrease the view of the map, rearrange the icons on the map, and move the map on the page.

- Use the plus sign (+) to increase magnification of the map.
- Use the minus sign (-) to decrease magnification of the map.
- Click the center dot to center the map on the page.
- Use the direction arrows to move the page in that direction.
- Use the selection tool under the navigation tool to toggle between moving the entire map or moving one CI on the map.

Map menu

The following options are available if you right-click the map background.

<table>
<thead>
<tr>
<th>Run Layout</th>
<th>Redraws the map with the current layout option.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fit To Screen</td>
<td>Resizes the map to fit all the nodes in the map window.</td>
</tr>
<tr>
<td>Reset Filters</td>
<td>Performs the same action as the Filters Reset option.</td>
</tr>
</tbody>
</table>

Node menu

The following options are available if you right-click a node.

<table>
<thead>
<tr>
<th>View Form</th>
<th>Displays the CMDB record of the selected CI in a new tab of the browser.</th>
</tr>
</thead>
<tbody>
<tr>
<td>View Map</td>
<td>Reloads the map using the selected CI as the new root node, with the currently defined layout setting. This option does not display on the root node.</td>
</tr>
<tr>
<td>View Related Tasks</td>
<td>Displays all tasks or outages associated with the selected CI, including incidents, problems, change requests, and follow-on tasks. This option is always available, even if there are no tasks associated with the CI. This option does not appear on collapsed nodes.</td>
</tr>
<tr>
<td>View Affected CIs</td>
<td>Shows a list of all tasks that have the CI listed as an Affected CI. This option is only visible when you access the map from the map icon in a task record's Configuration item field.</td>
</tr>
</tbody>
</table>
View Related Outages | Displays all outages involving the selected CI. This option only appears when there is an outage associated with the CI. This option does not appear on collapsed nodes.

Add Relationship | This option displays a dotted green line that you can drag to another CI to create a relationship link. A popup dialog allows you to define the relationship type.

Expand | Displays all CIs and components within a clustered node, or virtual groups (virtual nodes that appear when glide.bsm.too_many_children is reached). This option appears only if the node is a cluster node or a virtual group node.
   If Load More was previously used, then Expand reverts the results of the Load More operation.
   The number of additional icons to display is bound by the value of the glide.bsm.max_nodes property.

Collapse | Collapses all CIs and components within a cluster node back to a single node. Also, collapses a virtual group that has been expanded. This option only appears if the node has been expanded using the Expand menu item.
   If Load More was previously used, then Expand reverts the results of the Load More operation.

Run Layout From Here | This option re-runs the chosen layout using the current node. Use this option to get a new or clearer view on the same map.

Load More | Starting at the selected icon, loads the next level of the map, past the setting of Max Levels.
   Virtual grouping is not applied at the newly loaded level even if the criteria for virtual grouping is met.
   The number of additional icons to display is bound by the value of the glide.bsm.max_nodes property.

**Relationship menu**

The following options are available if you right-click a relationship link.

<table>
<thead>
<tr>
<th>View Relationship Form</th>
<th>Opens the CI Relationship form. You can modify the Parent, Type, and Child of the relationship from this form.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modify Relationship</td>
<td>Searches for and selects a new relationship for this link.</td>
</tr>
</tbody>
</table>
Cluster nodes in a Dependency Views map

Dependency Views maps can display cluster group nodes alongside individual CI nodes, and the child nodes of these cluster groups.

Clusters are CIs in the Cluster [cmdb_ci_cluster] table. A cluster CI is an organized set of computer CIs that work together as a single system. Each node in a cluster group represents a CI, typically a server, that can have referenced hardware, such as disks and network adapters.

Cluster nodes on a Dependency Views map can display in two modes:

- Collapsed mode: Displays only the cluster CI node without its child CI nodes. This mode avoids unnecessary clutter in large maps.
- Expanded mode: Displays the cluster CI node and all its child CI nodes.

Menu options available for a clustered node include Collapse and Expand which allow you to control the density on the map.

By default, Dependency Views collapses all cluster groups and displays clusters in collapsed mode on the map.

Annotation

Icons for cluster nodes and cluster group CI nodes are noted by the string "Cluster" and by a unique cluster icon. The system searches through all the component nodes in a cluster CI or collapsed node looking for tasks, outages, and trouble, such as incidents, problems, or change requests. This search evaluates only the number of levels that are displayed in the diagram.
Figure 16: An expanded cluster node displaying its child nodes
Virtual grouping of nodes in a Dependency Views map

To reduce the density on a map, Dependency Views automatically groups CIs of a similar CI type from the same level.

A large number of nodes can cause a Dependency Views map to become too dense to be helpful. Therefore, if the number of nodes with a similar CI type from same level, exceeds the value of the Maximum number of nodes (of a similar CI type and at the same level) to display before applying virtual grouping property, then those nodes are automatically grouped into a virtual group. A single node, the virtual group node is displayed to represent the virtual group, while all actual nodes in the virtual group (that are of a similar CI type), are hidden. Virtual group nodes represent CIs of a similar CI type but are not CIs by themselves and cannot have tasks assigned to them. The number of actual collapsed nodes in the virtual group is noted on the virtual group node.

By default, child nodes of a virtual group are not displayed. You can enable the Show children of virtual groups property to display child nodes underneath virtual groups.

Virtual grouping is not applied at the level underneath a virtual group even if the criteria for virtual grouping is met (the number of nodes with a similar CI type from that level exceeds the preconfigured property value). However, virtual grouping can happen at the following level if that criteria is met. This behaviour does not depend on any property settings, and you cannot change it.

Menu options for a virtual group include Expand and Collapse, which allow you to apply virtual grouping and display only the virtual group node, or to undo the virtual grouping and display all actual nodes.

Virtual links

A virtual node is connected to other nodes with a virtual link. A virtual link denotes that there such link between at least one CI in the virtual group, to another CI node on the map.

Note: Predefined filters do not apply to virtual groups. Therefore a virtual group displays even if it contains CIs that a predefined filter would have excluded. Upon the expansion of a virtual group, predefined filters are applied, and any or all of the CIs that were previously virtually grouped, might no longer display on the map.

Also, when using the node menu option Load More, virtual grouping is not applied at the newly loaded level even the criteria for virtual grouping is met.
Figure 17: An expanded virtual group
Use Dependency Views

Use the layout controls on a Dependency Views map to display elements in different configurations for easier management. Use the filter panel on the map to display fewer levels or to filter out elements you don't want to see, then save the filter for use later. Draw new relationships between elements or edit existing relationships.

View a Dependency Views map

When you display a Dependency Views map using one of the options below, the map is centered on the root CI, and displays the layout and number of levels defined in the map properties. If Operational Intelligence is activated, then a Dependency Views map provides a mode that lets you directly access metrics information for the CIs on the map.

General role requirements:

- To access a Dependency Views map from either the navigation menu, a script API, or directly from a URL, the minimum role required is the dependency_views. Some operations that are related to icons, indicators, and menu actions require the ecmdb_admin role. Some operations that are related to properties and dependency types require the admin role.
- Dependency Views enforces ACL permissions on CIs, and visually hides them and their relationship from the map if the permission requirement is not met.

The maps generated by Dependency Views are based on D3 and Angular technology, providing a modern interactive graphical interface to visualize configuration items and their relationships.

If Service Mapping is activated, Dependency Views maps are enhanced to display dependencies that reflect connections in service maps. In addition, the list of related services in the Details section, includes application services, and technical and manual services if Event Management is activated. All CIs that are included in a service, are displayed underneath the service node on the map.

Maps provided by Service Mapping are for application services, including comprehensive maps from the perspective of application services. For more information, see Service Mapping.

Administrators can configure the setting for the default layout of the map and number of levels displayed. When you access the map from a saved view, the map opens using the properties in the saved view, and not the default map properties.

Navigate to Dependency Views and open one of these modules:

- View Map in New Tab: Opens the map in a new, full screen tab without the application navigator.
- View Map: Opens the map in the content pane of the current tab.
- Saved Views: Opens a view of a map that you previously saved.

Click a number in the Version column, and then click the icon.

Save or load a Dependency Views map

In the View Map module, use the menu icon to save and load Dependency Views maps.

1. Navigate to Dependency Views View Map.
2. Click the view menu icon

3. Select Save View, Load View, or Last View.

Delete a saved Dependency Views map view

Use the Saved Views module to delete a previously saved view.

1. Navigate to Dependency Views Saved Views.
2. Use the checkbox in the first column of the table to select the map view that you wish to delete.
3. Select Delete from the Actions on selected rows drop-down menu.

Change the layout of Dependency Views map

You can select from different layout options for your Dependency Views map.

1. Navigate to Dependency Views View Map.
2. Select one of the following layout options from the menu across the top of the view.
   - Vertical: Displays the elements in a vertical tree pattern according to their upstream and downstream relationships. This is the default value for the initial display of the map.
   - Horizontal: Displays the elements in a horizontal tree pattern according to their upstream and downstream relationships.
   - Radial: Displays the elements in a radial pattern according to their upstream and downstream relationships.
   - Force: Centers the elements around the parent CI, regardless of upstream or downstream relationships.
   - Group: Groups the elements according to their CI type.
   - Details: Displays related alerts, incidents, problems, and related services.

Related Services displays application services, and if Event Management is activated then also technical services and manual services. You can double-click a service to display the map in the Event Management dashboard.

Filter the view of a Dependency Views map

You can filter a Dependency Views map to display specific types or categories of configuration items.

Use the filter panel to control which elements of the map are displayed and to save versions of a filter for later use.

1. Navigate to Dependency Views View Map.
2. Click the button to open Map Settings. Click a filter strip to expand or collapse it, and to set filter items.
<table>
<thead>
<tr>
<th>Filter panel strips and options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Save Custom Settings</td>
<td>Configure desired custom settings, then enter a name and click Save.</td>
</tr>
<tr>
<td></td>
<td>Custom settings can be loaded by using the Load Saved Custom Settings option.</td>
</tr>
<tr>
<td></td>
<td>Navigate to Dependency Views Saved Settings to display all saved custom settings.</td>
</tr>
<tr>
<td>Load Custom Settings</td>
<td>Apply previously saved custom settings to the current map.</td>
</tr>
<tr>
<td>Predefined Filters</td>
<td>Apply previously defined filters consisting of configuration type, CI type,</td>
</tr>
<tr>
<td></td>
<td>and relationship filters. You can Set a predefined filter as default on page 260.</td>
</tr>
<tr>
<td></td>
<td>This filter is applied first, before any other filters (such as Filter CIs by Depth) are applied.</td>
</tr>
<tr>
<td>Dependency Type</td>
<td>Apply a filter that runs in real time and generates a custom view of a service map for a specific CI.</td>
</tr>
<tr>
<td>Max Levels</td>
<td>Designate how many levels from the root CI display on the map.</td>
</tr>
<tr>
<td>Filter CIs by Depth</td>
<td>Designate which levels of CI display on the map.</td>
</tr>
<tr>
<td>Filter CIs by CI Type</td>
<td>Designate what CI types display in the map.</td>
</tr>
<tr>
<td>Filter CIs By CI Location</td>
<td>Designate what CI locations display in the map.</td>
</tr>
<tr>
<td>Filter CIs By CI Manufacturer</td>
<td>Designate what CI manufacturers display in the map.</td>
</tr>
<tr>
<td>Filter CIs By Audit Failure</td>
<td>Hides CIs that failed the CMDB health staleness test. This option is available only if there are any such CIs.</td>
</tr>
<tr>
<td>Filter Relationship Types</td>
<td>Designate what relationship types display in the map.</td>
</tr>
<tr>
<td>Map Indicators</td>
<td>Designate what types of tasks display and get counted in the map.</td>
</tr>
<tr>
<td>Remove Filtered Items</td>
<td>Off: Gray out filtered items on the map.</td>
</tr>
<tr>
<td></td>
<td>On: Do not display filtered items on the map.</td>
</tr>
<tr>
<td>Run Layout Automatically</td>
<td>On: The configured layout to the map is reapplied whenever the filter is changed.</td>
</tr>
<tr>
<td></td>
<td>Off: The map layout remains static when the filter is changed.</td>
</tr>
</tbody>
</table>
### Filter panel strips and options

<table>
<thead>
<tr>
<th>Description</th>
<th>Fit to Screen Automatically</th>
</tr>
</thead>
<tbody>
<tr>
<td>On:</td>
<td>The map magnification will increase or decrease automatically to display all CIs on the map.</td>
</tr>
<tr>
<td>Off:</td>
<td>The map magnification remains unchanged when the map is reloaded.</td>
</tr>
</tbody>
</table>

### Display metrics for CIs in a Dependency Views map

Operational Intelligence processes metrics data for CIs, calculates statistics and aggregations, and detects metrics anomalies. A Dependency Views map lets you switch to metrics mode to directly access the Insights Explorer that displays metrics data for CIs on the map.

The Operational Intelligence (com.snc.sa.metric) plugin must be activated to enable this functionality, and metrics data needs to be processed for the CIs on the Dependency Views map.

Open a Dependency Views map in metric mode which integrates a Dependency Views map with the Insights Explorer functionality that is tailored to the map. In this mode, you can access Insights Explorer functions directly from the map, to explore metrics data for the CIs on the map. All map CIs are accessible in the right hand side pane, from where you can drill into metrics data.

1. Navigate to Dependency Views View Map to open a map.
2. Right-click on a CI on the map and select View Metrics to open the Dependency View map in metrics mode.

   In the panel on the right side, the CI that you selected on the Dependency View map is selected by default, and the list of all the metrics available for that CI are displayed.

3. Click the ‘<’ sign on the left of the CI to display all the CIs that you can explore metrics for.

   The Insights Explorer is scoped for exploring only the CIs that currently display on the Dependency Views map, and you cannot add or remove CIs from the list. If you use map settings or filters to filter out CIs from the map, the same filtering will apply to the list of CIs that you can explore metrics for.

4. Click on a CI in the CIs list or right-click on a CI on the Dependency Views map, to drill down to the CI's metrics.

5. Click the Dependencies Map tab or the Metrics tab to switch modes:
   a) In Metrics mode: The full functionality of the Insights Explorer is available, you can create metric charts by dragging metrics into the canvas. You can modify chart settings, select different time ranges for the charts, and perform other actions as described in View metric values in the Insights Explorer.
   b) In Dependencies Map mode: Select a CI on the map to drill down to its metrics data, drop-down the Layout list to choose a different layout, or modify map settings.

### Perform actions on nodes in a Dependency Views map

You can view various related items for the nodes in a Dependency Views map.

If the node is a collapsed node or represents a cluster, the incidents, problems and change requests are for all the collapsed nodes.

1. Navigate to Dependency Views View Map.
2. Click the ▼

icon next to a node or right-click a node on the map, to access the following menu items:

<table>
<thead>
<tr>
<th>Table 29: Node Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>View Form</strong></td>
</tr>
<tr>
<td><strong>View Map</strong></td>
</tr>
<tr>
<td><strong>View Related Tasks</strong></td>
</tr>
<tr>
<td><strong>View Affected CIs</strong></td>
</tr>
<tr>
<td><strong>View Related Outages</strong></td>
</tr>
<tr>
<td><strong>Add Relationship</strong></td>
</tr>
<tr>
<td><strong>Expand</strong></td>
</tr>
<tr>
<td><strong>Collapse</strong></td>
</tr>
<tr>
<td><strong>Run Layout From Here</strong></td>
</tr>
</tbody>
</table>
Load More

Starting at the selected icon, loads the next level of the map, past the setting of Max Levels.

The number of additional icons to display is bound by the value of the glide.bsm.max_nodes property.

Export a Dependency Views map

You can export a Dependency Views map to an image in PNG format.

1. Navigate to Dependency Views View Map.
2. Configure the map view as you want the image to appear. The exported image displays the current view of the map.
3. Click the view menu icon.
4. Click Export Image.
5. Right-click the image and select Save Image As, Print, or any other menu option.

Note: You can not export images from a Dependency Views map using Internet Explorer as your browser.

6. Click the “X” button to close the Export Image window.

View collapsed nodes in a Dependency Views map

Cluster and virtually grouped nodes can be displayed in a collapsed mode to avoid unnecessary clutter in large maps.

1. To expand a collapsed node, right-click the CI and select Expand from the context menu.
2. To collapse an expanded cluster node with children, right-click the CI and select Collapse from the context menu.

Administer Dependency Views

Users with the admin role can control the appearance and behavior of Dependency Views by configuring map indicators, map related items, map icons, and menu actions.

Create or modify map indicators

Dependency Views maps and application service maps, use icons to display additional information for a CI by displaying its related records such as alerts, outages, incidents and problems. These icons are called map indicators.

The default configuration includes map indicators for the following record types:

- Open incident.
- Open alert.
• Unplanned current outage.
• Planned current outage, or an open problem.
• Current, planned, or recent change request.

You can filter out the display of affected CIs, alerts, current change requests, incidents and problems from the map settings menu. Also, you can create a map indicator to define additional record types, such as trouble sources for CIs in a service. You can also modify an existing map indicator, for example to use a different color scheme or to alter the priority of a task.

The Affected CI's map indicator appears for CIs in two related but not identical situations. It appears for CIs for which tasks such as change request, incident, or problem were directly created for, and for any CIs that were added in those tasks (parent tasks) as Affected CIs (The CI for which a task is directly created for, is automatically added as an affected CI in that task). The state of affected CI's depends on the status of the respective parent task. For as long as the parent task is active, the associated affected CIs continue to be impacted by the task issue. In a map, the Affected CI’s indicator displays for all affected CIs for as long as the parent task is active. On a map, the Affected CI tooltip displays the details of the task records in which the CI was added as an affected CI. However, the Details pane does not contain an Affected CI’s tab, and no further details about affected CIs, or the associated tasks are displayed. After the parent task is closed, the Affected CI’s indicator no longer displays for any of the tasks’ affected CIs. For information about affected CIs in Change Management, see Associate CIs to a change request.

Note: Details about affected CIs are derived from the task and the cmdb_ci tables and their extensions. Therefore, if you use custom tables to store CIs for incidents, problems and changes, it affects the details that are displayed for affected CIs.

For more information on how map indicators are used to show tasks and outages in clusters and collapsed nodes, see Cluster nodes in a Dependency Views map on page 246.

1. Navigate to Dependency Views Map Indicators.
2. Click New to create a new map indicator, or click the name of an indicator from the Table column to modify an existing map indicator.
3. Fill in the fields on the form, as appropriate.

Table 30: Map Indicator form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
</table>
| Table | Name of the table represented by this map indicator.  
Note: The list shows only tables and database views that are in the same scope as the map indicator. Views are not supported, although included in the list. |
| Name | Name of the indicator. |
| Order | Priority order of the task. The highest priority task is the indicator with the lowest order number. When more than one indicator is present on a CI, the displayed color is the color associated with the highest priority task.  
Additionally, a glyph on a CI displays the color indicator of the highest priority task attached to that CI. |
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Icon</td>
<td>File name and path of the icon image file, which can be a system image.</td>
</tr>
<tr>
<td></td>
<td>• To create a new icon, see <em>Create or modify map icons</em> on page 258</td>
</tr>
<tr>
<td></td>
<td>• To create or use a system image see.</td>
</tr>
<tr>
<td>CMDB CI field</td>
<td>Name of the field on the selected table that contains the configuration item.</td>
</tr>
<tr>
<td>Start field</td>
<td>The record property that determines the time-point on the metric chart timeline for placing records in the Insights Explorer.</td>
</tr>
<tr>
<td></td>
<td>Possible values depend on the selected Table. For example, the incident indicator has values such as Actual end, Actual Start, and Approval Set.</td>
</tr>
<tr>
<td>Description field</td>
<td>Name of the field on the selected table that contains the description of the configuration item.</td>
</tr>
<tr>
<td>Description</td>
<td>Text to display when hovering over the indicator. Alphanumeric characters and spaces are valid for this field.</td>
</tr>
<tr>
<td>Conditions</td>
<td>Condition builder that specifies for which CIs to apply this indicator. For example, a CI that has a current past outage is highlighted for 5 days. You can configure a condition to designate a different timeframe for what is considered to be current.</td>
</tr>
<tr>
<td>Active in Service Map</td>
<td>Enable to make the toggle for the specified table available in the Settings dialog box for application service maps. You can then toggle between displaying or not displaying the respective records on the map.</td>
</tr>
<tr>
<td>Active Dependencies</td>
<td>Enable to make the toggle for the specified table available in the Settings dialog box for Dependency Views maps. You can then toggle between displaying or not displaying the respective records on the map.</td>
</tr>
<tr>
<td>Active in Metrics</td>
<td>Enable to make the toggle for the specified table available in the Settings dialog box for the Insights Explorer. You can then toggle between displaying or not displaying the respective records on the Insights Explorer.</td>
</tr>
<tr>
<td>Label</td>
<td>Text to display for the indicator on the map.</td>
</tr>
<tr>
<td>Tooltip Label</td>
<td>The prefix portion of the tooltip (Tooltip Label : Tooltip info).</td>
</tr>
</tbody>
</table>
4. Click Submit to enter a new map indicator. Click Update to modify an existing map indicator.

For an indicator to appear in a Dependency Views map, a CI must meet all filter conditions, and Active Dependencies must be selected.

Create or modify map icons

You can upload new icons or modify existing icons to customize the icon displayed for a CI in maps in Dependency Views, Service Mapping, and Event Management.

The icons used in Dependency Views maps are listed in the Map Icons module. Records in the Map Icons list are arranged by CI classes, such as cmdb_ci_linux_server. The path to the default image files is https://<instance name>.service-now.com/images/app.ngbsm/<image name.svg>. For information about uploading images to the database, see Storing images in the database.

Role required: admin or cmdb_admin roles are required to access the records in this table [ngbsm_icon] to upload new icons.

- Navigate to Configuration CI Class Manager, and:
  a) Click Hierarchy to display the CI Classes list.
  b) Select a class to modify the icon for.
  c) In the class navigator bar, expand Class Info and then select Basic Info. On the Basic Info form, click Icon.
  d) In the Icons dialog box, select an icon and then click Update.
  e) On the Basic Info form, click Update.

- Navigate to Dependency Views Map Icons, and:
  a) Click New to create a new map icon or click the name of an existing icon in the Label column to modify an existing icon.
  b) Fill in the fields on the form, as appropriate.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CI Type</td>
<td>Label or the informal name of the CI table that this icon represents in the view.</td>
</tr>
<tr>
<td>Icon</td>
<td>Name of the icon.</td>
</tr>
<tr>
<td>URL</td>
<td>Path to the icon image using the following format: /image name.svg. Click the lock icon to enter a new path.</td>
</tr>
</tbody>
</table>

c) Fill in the fields on the form, as appropriate.
d) Click Submit to enter a new icon. Click Update to modify an existing icon.
You can modify a Dependency Views map indicator to use the new icon.

Create a predefined filter

Create filters to narrow down the CIs that are displayed on a Dependency Views map. You can create filters that are based on CIs’ class, CIs’ attributes, or CIs’ relationships.

Role required: ecmdb_admin

Create a predefined filter that you can then select to determine the scope of the CIs that are displayed in a Dependency Views map. Configuration type filters filter by CI class, CI filters filter by CI attributes, and relationship filters filter by relationships. Only CIs that match at least one of the configuration type filters (if any exists), and at least one of the CI filters (if any exists), and at least one of the relationship type filters (if any exists) - are displayed on the map. If no filters are defined, then no filtering is applied.

**Note:** Predefined filters do not apply to virtual groups. Therefore a virtual group displays even if it contains CIs that a predefined filter would have not included. Upon the expansion of a virtual group, predefined filters are applied, and any or all of the CIs that were previously virtually grouped, might no longer display on the map.

1. Navigate to Dependency Views Predefined Filters.
2. On the Predefined Filters page, click New.
3. Type in a Name for the filter. Click Roles, and in the Roles dialog box, select the roles that this filter will be available for.
4. Right-click on the page header, and click Save.
5. To create a configuration type filter:
   a) Click Configuration Types, and then click Edit.
   b) In the Collection slushbucket, select the classes that CIs must belong to in order to be displayed on the map, and move them to the Configuration Types List.
   c) Click Save.
6. To create a CI filter:
   a) Click CI Filters, and then click New.
   b) In the CI Filters page enter conditions to filter CIs by specific attribute values.
   c) Click Submit.
7. To create a relationship type filter:
   a) Click Relationship Type, and then click New.
   b) In the Collection slushbucket, select the relationships that CIs must have in order to be displayed on the map, and move them to the Relationship Types List.
   c) Click Save.

After creating a predefined filter, you can apply it to a map:

1. Click the icon to open Map Settings.
2. Select a filter from the Predefined Filters list.
3. Click Apply.

Set a predefined filter as default

You can set a custom predefined filter as the default predefined filter for viewing maps.

1. Create the custom predefined filter to be used as the default predefined filter.
2. On the predefined filter form, click the context menu and select Copy sys_id.
3. Navigate to User Administration User Preferences.
4. Click New and create a new user preference record using these values:
   - Name: ecmdb.ciview
   - Type: String
   - Value: Paste the sys_id of the custom predefined filter
   - User: Leave blank to create a system-wide setting
   - Description: Description of the predefined filter
   - System: Selected
5. Click Submit.

In Map Settings, when you select the Default option for Predefined Filters, the custom predefined filter that was set, will be applied.

Create or modify Map Related Items

The Map Related Items module relates referenced CIs to one another, which allows them to be displayed in a Dependency Views map.

The base system configuration includes the following tables and relates them to items in the Computer [cmdb_ci_computer] and Server [cmdb_ci_server] tables.

- Disk [cmdb_ci_disk]
- Network Adapter [cmdb_ci_network_adapter]
- Database [cmdb_ci_database]

Some additional referenced CIs that can be related in this manner are file systems and running processes.

In the following example, computer nodes in the map are related to network adapter nodes if the Configuration Item field of the adapter records reference the specific CI node. Access or create a network adapter record from the Network Adapter related list in the cmdb_ci_computer record.
Figure 18: Dependency Views Configuration Item field

The Dependency Views map for the *JEMPLOYEE-IBM computer shows the network adapter attached to the computer.

Figure 19: Dependency Views map Related Items example

You can configure Dependency Views to display CIs that have no relationship record, but are related to other CIs by reference fields.

1. Navigate to Dependency Views Map Related Items.
2. Click New to create a new related item, or click in the row of an existing CI to modify an existing map related item.
3. Fill in the fields on the form, as appropriate.
   See the Related Items form table.
4. Click Submit to enter a new map related item. Click Update to modify an existing map related item.
Table 32: Related Items form

<table>
<thead>
<tr>
<th>Control</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration item</td>
<td>CI that represents the base node or a CI in a table that extends the base node table. In the base system, the configuration item that represents the base node is Computer [cmdb_ci_computer], which includes all types of workstations and servers.</td>
</tr>
<tr>
<td>Related item</td>
<td>Table name of the related item. Only the cmdb_ci table and tables that extend it are displayed in the choice list.</td>
</tr>
<tr>
<td>Related field</td>
<td>Field that links this related item to the configuration item. In many cases, the appropriate value is automatically populated in the field after the first two fields are selected. Select the drop-down menu for additional options.</td>
</tr>
<tr>
<td>Active</td>
<td>Check box that allows you to enable or disable this record.</td>
</tr>
</tbody>
</table>

Create or modify Dependency Views menu actions

To modify an existing menu option, first you create a copy of the original menu action record, and then you modify the copy.

This ensures that your instance can update the record normally during the upgrade process and allows you to quickly restore the original menu option, if necessary.

1. To create a new menu option, navigate to Dependency Views Map Menu Actions and click New. Fill in the fields on the form, as appropriate. See the Menu Action form table.
2. To modify an existing menu option, navigate to Dependency Views Map Menu Actions.
3. Open the menu action you want to edit.
4. Right-click in the header and click Insert and Stay. This step creates a duplicate copy of the menu action and leaves it open for editing.
5. Change the name of the copied record to avoid confusion.
6. Modify the form fields as necessary and save the record.
7. Open the original record and disable it by clearing the Active check box.

Table 33: Menu Action form

<table>
<thead>
<tr>
<th>Control</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Descriptive name that appears as the menu option.</td>
</tr>
<tr>
<td>Active</td>
<td>Check box that allows you to enable or disable this record.</td>
</tr>
<tr>
<td>Control</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Condition</td>
<td>Condition that triggers the display of this menu option. If the condition evaluates to false the menu option does not display. Script is evaluated in JavaScript in the user's browser and does not have access to all the APIs that Business Rules do. For details on available parameters, see Condition Parameters.</td>
</tr>
<tr>
<td>Item</td>
<td>Map element for which the menu option displays. Valid values are:</td>
</tr>
<tr>
<td></td>
<td>• Canvas for the menu on the map background.</td>
</tr>
<tr>
<td></td>
<td>• Node for the menu on a CI.</td>
</tr>
<tr>
<td></td>
<td>• Relationship for the menu on a relationship link.</td>
</tr>
<tr>
<td>Order</td>
<td>Physical location of the option in the menu. The option with the lowest order number appears first in the menu. All editable and custom options appear below the permanent menu options.</td>
</tr>
<tr>
<td>Script</td>
<td>Script that is executed in the browser when the menu option is selected. Script is evaluated in JavaScript in the user's browser and does not have access to all the APIs that Business Rules do.</td>
</tr>
<tr>
<td>Type</td>
<td>Menu action type being created, either a menu option or a menu separator. The menu separator is a single line. When the type is a separator, the Script field is ignored.</td>
</tr>
</tbody>
</table>

### Condition and script parameters for menu actions

You can use the following condition and script parameters for menu actions.

#### Condition parameters

**Note:** The usual regular expression conventions are valid in the condition field, such as ! for NOT, && for AND, and || for OR.

The Condition field contains a boolean expression that evaluates to true or false. If the condition is true or if there is no condition, the specified option appears in the menu when you right-click a CI or a relationship link. When you select the option from the menu, ServiceNow executes the associated script.
Table 34: Common Elements for Building a Condition

<table>
<thead>
<tr>
<th>Text</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>item</td>
<td>Node or reference link's data on which you performed the right-click action.</td>
</tr>
<tr>
<td>item.label</td>
<td>Label of the node.</td>
</tr>
<tr>
<td>item.ci_type</td>
<td>CI's type (table), such as cmdb_ci_service.</td>
</tr>
<tr>
<td>item.name</td>
<td>Name of CIs. CI's type name or the table label.</td>
</tr>
<tr>
<td>item.location</td>
<td>Location of the CI, such as New York.</td>
</tr>
<tr>
<td>item.manufacturer_name</td>
<td>Name of the CI’s manufacturer, such as Dell Inc.</td>
</tr>
<tr>
<td>item.id</td>
<td>The sys_id of the CI.</td>
</tr>
<tr>
<td>item.is_selected</td>
<td>The item that is selected in the map.</td>
</tr>
<tr>
<td>item.level</td>
<td>The current default level.</td>
</tr>
<tr>
<td>item.locationId</td>
<td>The sys_id of the CI node's location.</td>
</tr>
<tr>
<td>item.locationName</td>
<td>The full address of the location.</td>
</tr>
<tr>
<td>item.manufacturerId</td>
<td>The sys_id of the CI's manufacturer.</td>
</tr>
</tbody>
</table>

Table 35: Valid Conditions for Condition Parameters

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>item.is_collapsed</td>
<td>The node is a collapsed node.</td>
</tr>
<tr>
<td>item.is_cluster</td>
<td>The node is a cluster node.</td>
</tr>
</tbody>
</table>

Script parameters

Menu action scripts are executed on the client when a user clicks the menu option. You can use the same building blocks in scripts as in conditions. Menu action scripts do not function on separators. These are some additional, useful expressions for scripts:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>item.id</td>
<td>The sys_id of the CI node or relationship link.</td>
</tr>
<tr>
<td>item.source</td>
<td>The sys_id of the relationship's parent or child.</td>
</tr>
<tr>
<td>item.target</td>
<td>The sys_id of the relationship's parent or child.</td>
</tr>
<tr>
<td>item.label</td>
<td>The name of the CI node, such as IronMail-SD-02.</td>
</tr>
<tr>
<td>item.location</td>
<td>The sys_id of the CI node's location.</td>
</tr>
<tr>
<td>item.location_name</td>
<td>The full address of the location, such as 4616 Clairemont Drive, North Clairemont, San Diego CA.</td>
</tr>
</tbody>
</table>
Create or edit a dependency type

Use one of the dependency types provided, or create a custom dependency type with a script that will execute in real time to generate a custom view of a Dependency Views map for a specific CI.

Create a JavaScript to customize the map. The script must comply with JavaScript syntax guidelines and the directions in the default script template, and it can call platform APIs. Use a dependency type, for example:

- To narrow down and simplify a map, leaving out CIs that are not important for a specific task.
- To include only specific CIs that are hidden by default, such as qualifiers, end-points, and entry points.
- To display virtual relationships that are calculated, and that otherwise do not exist in the CMDB.
- As a tool to plan a new topology deployment that is based on existing resources.

The following dependency types are included in the base system:

| Application to Network Devices | Returns the network devices in the network paths leading to/from the given CI. |
| Network Device to Applications | Returns the applicative CIs which are target or source of network paths containing the given network device. In addition, returns the hosts of those applicative CIs, and for an applicative CI that is an inclusion, its parent CI is returned too. |
| Physical Network Connections | Returns hosts/network devices that are physically connected to the given host or network device. |
| Flow Dependencies | Returns all the server to server connections that were discovered using the Netflow collector. The script builds a graph based on data in the [sa_flow_server_comm] table. This table contains pairs of services represented by an IP and a listening port that are communicating with each other. For more information, see Data collection and discovery using Netflow and Data collection and discovery using VPC Flow Logs. |
| Show All Relationships | Returns all qualifiers, end points, and entry points. This dependency type is disabled by default and is typically enabled for debugging and tracking purposes. |

1. Navigate to Dependency Views Dependency Types.
2. In the Load Filter Scripts list view, select an existing dependency type, or click New.
3. Enter or modify a script, adhering to the guidelines and requirements in the script template that is provided.
4. Click Submit.

In a Dependency Views map, you can click Use Dependency Type to apply a custom script defined in a dependency type.
Compliance

Compliance is a tool set that enables administrators to certify ServiceNow data for correctness and fix any discrepancies found in the data.

Compliance offers these certification options to suit the size and requirements of your organization:

Table 36: Compliance certification options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desired State</td>
<td>Automatically compares the actual attributes and relationships of specific ServiceNow records against the desired states for those records. For example, an audit can detect a Linux database server with insufficient RAM or whose Depends on relationships with another CI is incorrect. The system then publishes any discrepancies found and automatically assigns follow-on tasks to qualified users to bring that server into compliance.</td>
</tr>
<tr>
<td>Architecture Compliance</td>
<td>Automatically compares the actual attributes of specific CIs, such as CPU count, RAM, or disk size against the expected attributes for those CIs. The system publishes any discrepancies found and automatically assigns remediation tasks to qualified users.</td>
</tr>
</tbody>
</table>

Compliance Activation

Compliance functionality is provided by the Certification Core plugin.

The Certification Core plugin which contains shared functionality required for certification audits. It consists of the following plugins, and is activated by default.

- Desired State (activated by default)
- Architecture Compliance (activate)
- Data Certification (activate)

Installed with Compliance

These components are installed with the Certification Core plugin.

Demo data is included with the Desired State and Architecture Compliance plugins.

The Certification Core plugin adds or modifies these tables.
### Table 37: Compliance Certification Core tables

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audit [cert_audit]</td>
<td>Contains all the data required to run an audit, including the users assigned to follow-on tasks and the run schedule.</td>
</tr>
<tr>
<td>Audit Result [cert_audit_result]</td>
<td>Contains the results of specific, certification audits.</td>
</tr>
<tr>
<td>Follow On Task [cert_follow_on_task]</td>
<td>Contains the tasks that were generated from an audit discrepancy.</td>
</tr>
<tr>
<td>Certification Template [cert_template]</td>
<td>Contains the definition of the desired state of the record. The template includes a filter that identifies the records to evaluate and the expected attributes and relationship values. Contains the records to certify, the expected attributes, and the expected relationship values.</td>
</tr>
<tr>
<td>Certification Condition [cert_cond]</td>
<td>Base table that defines the desired attribute or relationship conditions used in templates.</td>
</tr>
<tr>
<td>Certification Attribute Condition [cert_attr_cond]</td>
<td>Contains the conditions that define the desired CI attribute values. This table extends the Certification Condition [cert_cond] base table.</td>
</tr>
<tr>
<td>Certification CI Relationship Condition [cert_ci_rel_cond]</td>
<td>Contains the CI to CI relationship conditions. This table extends the Certification Condition [cert_cond] base table.</td>
</tr>
<tr>
<td>Certification User Relationship Condition [cert_user_rel_cond]</td>
<td>Contains the CI to user relationship conditions. This table extends the Certification Condition [cert_cond] base table.</td>
</tr>
<tr>
<td>Certification Group Relationship Condition [cert_group_rel_cond]</td>
<td>Contains the CI to group relationship conditions. This table extends the Certification Condition [cert_cond] base table.</td>
</tr>
<tr>
<td>Certification Related List Condition [cert_related_list_cond]</td>
<td>Contains the related list conditions. This table extends the Certification Condition [cert_cond] base table.</td>
</tr>
<tr>
<td>Certification Filter [cert_filter]</td>
<td>Contains a certification filter, including the table that contains the records to audit and the filter conditions.</td>
</tr>
</tbody>
</table>

### User roles

The certification role is automatically assigned to all users with the itil role when the Certification Core plugin is activated or when compliance applications are upgraded. Certification core installs two business rules, both called Add Certification Role To Manager, that perform similar tasks on different tables. One rule checks for a manager specified on the User [sys_user] table, and the other checks for the certification role on the User Role [sys_user_has_role] table. When both a manager and the certification role are specified for a user, the system automatically grants the certification role to the manager. This functionality
ensures that a certification task can be escalated successfully to the next level. The system grants this automatic role to the user's immediate manager only and not to others up the management chain.

**Note:** When a manager has only the certification role and no other role, the manager is considered a Requester and is not counted as a subscribed user (Fulfiller).

### Table 38: Compliance Certification Core user roles

<table>
<thead>
<tr>
<th>Name</th>
<th>Contains roles</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>certification</td>
<td>none</td>
<td>Can read and update certification tasks to resolve discrepancies.</td>
</tr>
<tr>
<td>certification_filter_admin</td>
<td>none</td>
<td>Can create, read, and update certification filters.</td>
</tr>
<tr>
<td>certification_admin</td>
<td>certification, certification_filter_admin</td>
<td>Can manage the entire certification process. These users can create, edit, and delete all certification records.</td>
</tr>
</tbody>
</table>

### UI policies

### Table 39: Compliance Certification Core UI policies

<table>
<thead>
<tr>
<th>Name</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make table read only</td>
<td>Audit [cert_audit]</td>
<td>Sets the table field derived from the selected filter to read-only.</td>
</tr>
<tr>
<td>Hide Audit Type</td>
<td>Audit [cert_audit]</td>
<td>Hides the Audit type field.</td>
</tr>
<tr>
<td>Hide next scheduled run</td>
<td>Audit [cert_audit]</td>
<td>Hides the Next scheduled run date when an audit is inactive or on-demand.</td>
</tr>
<tr>
<td>Show task fields when create tasks is set to true</td>
<td>Audit [cert_audit]</td>
<td>Displays all fields related to creating tasks when the user selects the Create tasks check box.</td>
</tr>
<tr>
<td>Make name mandatory</td>
<td>Audit [cert_audit]</td>
<td>Makes Name a mandatory field.</td>
</tr>
<tr>
<td>Prevent editing of Last run date</td>
<td>Audit [cert_audit]</td>
<td>Makes Last run date field read-only.</td>
</tr>
<tr>
<td>Name</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>---------------------------</td>
<td>-------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Show User field                     | Audit [cert_audit]        | Shows or hides fields based on the Assignment type selected. The system shows the User field when you select the following assignment types:  
|                                     |                           | • User Field if the Assign to empty option is Create Assigned Task.          |
|                                     |                           | • Specific User                                                              |
| Show Assign to fields               | Audit [cert_audit]        | Shows or hides fields based on the Assignment type selected. The system shows the Assign to field when the assignment type is User Field. |
| Show Assignment Fields              | Audit [cert_audit]        | Shows or hides fields based on the Assignment type selected. The system shows the Assign to empty field when you select either of the following assignment types:  
|                                     |                           | • User Field                                                                 |
|                                     |                           | • Group Field                                                                |
| Show Group field                    | Audit [cert_audit]        | Shows or hides fields based on the Assignment type selected. The system shows the Group field when you select either of the following assignment types:  
|                                     |                           | • Specific Group                                                             |
|                                     |                           | • Group Field if the Assign to empty option is Create Assigned Task.         |
| Hide "run" associated fields when active is set to false | Audit [cert_audit]       | Hides these scheduling fields when the audit is inactive:                  
|                                     |                           | • Run                                                                        |
|                                     |                           | • Day                                                                        |
|                                     |                           | • Time                                                                       |
|                                     |                           | • Last scheduled run                                                         |
| Show script window on Scripted Audit | Audit [cert_audit]       | Displays the Run this script field when the audit type is Scripted.        |
| Make table read only                | Certification Condition [cert_cond] | Sets the table field derived from the selected filter to read-only.     |
Script includes

Table 40: Compliance Certification Core script includes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DesiredStateUtil</td>
<td>Utility functions for desired state, used to clone a template for Insert functionality.</td>
</tr>
<tr>
<td>CMDBRElationshipAjax</td>
<td>Tool to get all relationships for a given table.</td>
</tr>
<tr>
<td>RelationshipQueryParseAjax</td>
<td>Parses condition filters. This script include is the internal code used in generating the compliance conditions.</td>
</tr>
<tr>
<td>CertificationUtils</td>
<td>Utility functions for certification that find Next run time value, and so on.</td>
</tr>
<tr>
<td>CertTaskEscalationTimerPercentage</td>
<td>Utility method for setting escalation timer durations.</td>
</tr>
<tr>
<td>ConditionUtilsAjax</td>
<td>AJAX utilities for parsing queries into a human-readable format.</td>
</tr>
<tr>
<td>DeleteInactiveVersionsAjax</td>
<td>AJAX server-side script to delete all inactive versions of a record.</td>
</tr>
</tbody>
</table>

Client scripts

Table 41: Compliance Certification Core client scripts

<table>
<thead>
<tr>
<th>Name</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make audit type read only if not new</td>
<td>Certification Template [cert_template]</td>
<td>Sets the correct audit type for new records, and if the record is not new, sets the Audit type field to read only.</td>
</tr>
<tr>
<td>Update table name (filter)</td>
<td>Audit [cert_audit]</td>
<td>Updates the table Name field when the filter is updated.</td>
</tr>
<tr>
<td>Update table name</td>
<td>Audit [cert_audit]</td>
<td>Updates the table Name field when the template is updated.</td>
</tr>
<tr>
<td>Set table name on new</td>
<td>Audit [cert_audit]</td>
<td>Returns the table name from the template or filter.</td>
</tr>
<tr>
<td>Update table name</td>
<td>Certification Template [cert_template]</td>
<td>Updates the table Name field when a new filter is chosen and checks all existing conditions to see if they work for the new table.</td>
</tr>
<tr>
<td>Show conditions when table is set</td>
<td>Certification Template [cert_template]</td>
<td>Shows and hides conditions appropriately when the table is set.</td>
</tr>
</tbody>
</table>
### Business rules

#### Table 42: Compliance Certification Core business rules

<table>
<thead>
<tr>
<th>Name</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reset filter when audit type changes</td>
<td>Certification Template [cert_template]</td>
<td>Clears the filter and updates the lists shown when the audit type is changed.</td>
</tr>
<tr>
<td>Clone condition</td>
<td>Certification Condition [cert_cond]</td>
<td>Part of certification versioning. This business rule retains the original ID when a condition is changed.</td>
</tr>
<tr>
<td>Copy audit type from audit</td>
<td>Audit Result [cert_audit_result]</td>
<td>Ensures that all audit results have the same audit type as the audit that generated them.</td>
</tr>
<tr>
<td>Copy values from template</td>
<td>Audit [cert_audit]</td>
<td>When a user selects a template, and updates the table, filter, and audit type from the template.</td>
</tr>
<tr>
<td>Delete condition</td>
<td>Certification Condition [cert_cond]</td>
<td>Part of certification versioning that deletes a condition.</td>
</tr>
<tr>
<td>Prevent deletion of audit with results</td>
<td>Audit [cert_audit]</td>
<td>Prevents deletion of an audit containing results.</td>
</tr>
<tr>
<td>Prevent delete of Filter with Template</td>
<td>Certification Filter [cert_filter]</td>
<td>Prevents deletion of a filter still linked to a template or audit.</td>
</tr>
<tr>
<td>Prevent deletion of result with task</td>
<td>Audit Result [cert_audit_result]</td>
<td>Prevents deletion of an audit result with an attached task.</td>
</tr>
<tr>
<td>Prevent delete of Template with Audit</td>
<td>Certification Template [cert_template]</td>
<td>Prevents deletion of a template still being used by an audit.</td>
</tr>
<tr>
<td>Update conditions' tables</td>
<td>Certification Template [cert_template]</td>
<td>When storing template conditions, properly run all workflows and update the condition fields to contain the display version of the conditions.</td>
</tr>
<tr>
<td>Update filter version</td>
<td>Certification Filter [cert_filter]</td>
<td>Creates a version when the filter changes in any meaningful way.</td>
</tr>
<tr>
<td>Update next run time</td>
<td>Audit [cert_audit]</td>
<td>Updates the time in the Next scheduled run field when an audit is modified.</td>
</tr>
<tr>
<td>Name</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>--------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Update next run time during execution</td>
<td>Audit [cert_audit]</td>
<td>When the audit runs, update the Next scheduled run field to the next time the audit is scheduled to run.</td>
</tr>
<tr>
<td>Update table</td>
<td>Certification Template [cert_template]</td>
<td>Update the stored table to the table of the filter.</td>
</tr>
<tr>
<td>Update template version</td>
<td>Certification Template [cert_template]</td>
<td>Creates a version when the template changes in any meaningful way.</td>
</tr>
</tbody>
</table>

**Compliance Templates and Audits**

The Templates and Audits modules on the top level of the Compliance menu enable a certification_admin user to create, edit, and delete all template and audit types.

You can use Compliance Templates and Audits to evaluate records for any table in the ServiceNow system, not just those tables extending the Configuration Item [cmdb_ci] table. Compliance audits certify record attributes only. Compliance templates can be used in Control Test Definitions in Governance Risk and Compliance.

**Compliance Overview module**

The Compliance Overview module is a type of homepage.

The Compliance Overview module summarizes:

- Current audit states
- Outstanding certification tasks
- Compliance discrepancies
- Upcoming audits
- General state of compliance audits for Data Certification, Desired State, Architectural Compliance, and Scripted audits

To use the Compliance Overview:

1. Navigate to ComplianceOverview.
2. Click elements within the reports to obtain more information.
   - For example, click the Disk space (GB) bar in the Compliance Discrepancies chart to open a list of audit results filtered by disk space attributes.
### Compliance Overview

#### Data Certification in Progress Tasks
- Data Center Zone Consumption: 63
- Critical Business Services: 67
- Architecture Compliance: 133

#### 30/60/90 Day Task Aging

#### Compliance Deficiencies

#### Outstanding Certification Tasks

<table>
<thead>
<tr>
<th>Task ID</th>
<th>Task Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Task 1 description</td>
</tr>
<tr>
<td>2</td>
<td>Task 2 description</td>
</tr>
<tr>
<td>3</td>
<td>Task 3 description</td>
</tr>
</tbody>
</table>

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Compliance Overview module roles

Only users with certain roles can access the Overview module.
The different levels of access are:

<table>
<thead>
<tr>
<th>Role</th>
<th>Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>certification</td>
<td>View (view overview page and refresh reports)</td>
</tr>
<tr>
<td>certification_admin</td>
<td>• View (view overview page and refresh reports)</td>
</tr>
<tr>
<td></td>
<td>• Customize (refresh, add, delete, and rearrange reports)</td>
</tr>
<tr>
<td></td>
<td>View, customize</td>
</tr>
<tr>
<td>admin</td>
<td>• View (view overview page and refresh reports)</td>
</tr>
<tr>
<td></td>
<td>• Customize (refresh, add, delete, and rearrange reports)</td>
</tr>
<tr>
<td></td>
<td>• Edit (can edit gauges)</td>
</tr>
</tbody>
</table>

Architecture Compliance

Architecture Compliance performs scheduled or on-demand audits of configuration management database (CMDB) data to determine which configuration items (CI) match the expected attributes.

The compliance process checks servers to ensure that their resources, such as CPU speed or memory, comply with standards set by your organization. Audit reports show any discrepancies in the attributes of the target CIs, and ServiceNow automatically assigns follow-on tasks to qualified users who can remediate those discrepancies.

Activate Architecture Compliance

Administrators can activate the Architecture Compliance plugin to access the application.

Activating this plugin automatically activates these additional plugins.

- Certification Core plugin contains shared functionality required for certification audits.
- Version Management plugin manages certification filter and template versions.

1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.
   - If the plugin depends on other plugins, these plugins are listed along with their activation status.
   - If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).
4. If available, select the Load demo data check box.
Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.

You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.

5. Click Activate.

Architecture Compliance

Architecture Compliance manages scheduled or on-demand reviews of CMDB data to determine which configuration items (CI) match expected attributes. The compliance audits check servers to ensure that their physical resources, such as CPU speed or memory, comply with certain standards.

The administrator responsible for compliance checking creates template definitions of expected attributes and then schedules an audit to check CIs for compliance. The audit results identify CIs that pass certification and itemize the discrepancies in those CIs that fail. ServiceNow automatically generates and assigns follow-on tasks to track the process of getting the CIs back into compliance. Users with the admin role activate Architecture Compliance.

Architecture Compliance Process

Perform these tasks in this order to certify configuration items with Architecture Compliance.

1. Create a filter.
   Create a filter that defines a subset of configuration items to certify. You can create multiple versions of a filter, and then activate the version you want to use for compliance checking. Architecture compliance only supports filters on the Configuration Item [cmdb_ci] table and all tables that extend it.

2. Create a template.
   Create template conditions using values from reference fields in a related list or conditions that define the expected physical attributes of each CI in an audit. The template uses a filter to determine which configuration items the system examines based on these conditions.

3. Create and run an audit.
   Create and schedule an audit or run an audit on demand. The audit generates a set of results based on the conditions in the template you specify.

4. View audit results.
   View the audit results which display any discrepancies between the expected state, as expressed by the template conditions, and the actual state of the target configuration items.

5. Correct discrepancies.
   Correct the discrepancies the audit found by completing the follow-on tasks created by the system.

Architecture Compliance Overview module

The Architecture Compliance Overview module displays various architecture compliance reports. The Overview module is a type of homepage.

Only compliance users with certain roles can access the Overview module. The different levels of access are:
Table 44: Access levels per role

<table>
<thead>
<tr>
<th>Role</th>
<th>Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>certification</td>
<td>View (view overview page and refresh reports)</td>
</tr>
</tbody>
</table>
| certification_admin | • View (view overview page and refresh reports)  
|                  | • Customize (refresh, add, delete, and rearrange reports)    |
|                  | View, customize                                              |
| admin            | • View (view overview page and refresh reports)               |
|                  | • Customize (refresh, add, delete, and rearrange reports)    |
|                  | • Edit (can edit reports)                                    |

Using the Architecture Compliance Overview Module

To use the Architecture Compliance Overview module, navigate to Compliance > Architecture Compliance > Overview and click elements within the gauges to obtain more information.

The available reports are:

Table 45: Architecture Compliance Overview Module Gauges

<table>
<thead>
<tr>
<th>Report</th>
<th>Description</th>
<th>Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>30/60/90 Day Task Aging</td>
<td>All outstanding follow-on tasks grouped by age in 30-day increments</td>
<td>Certification Task</td>
</tr>
<tr>
<td>Architecture Compliance Discrepancies</td>
<td>All audited attribute discrepancies</td>
<td>Audit Results</td>
</tr>
<tr>
<td>Hierarchical Task Roll Up</td>
<td>All follow-on tasks grouped by Assigned to user</td>
<td>Follow On Task</td>
</tr>
<tr>
<td>Outstanding Architecture Compliance Tasks</td>
<td>All follow-on tasks in the Pending, Open, or Work in Progress state</td>
<td>Follow On Task</td>
</tr>
<tr>
<td>Upcoming Architecture Compliance Audits</td>
<td>All scheduled audits</td>
<td>Audit</td>
</tr>
</tbody>
</table>
Architecture Compliance roles

To access or configure certification elements, a user must have the certification_admin role. These users can create, update, and delete filters if they have the proper access to necessary tables.

In the base ServiceNow system, certification_admin users have limited system rights and do not have access to all the necessary tables. When assigning compliance resources, make sure to grant additional roles to the certification_admin user as needed. For example, the certification administrator needs roles that grant access to these tables:

- Company [core_company]
- Cost Center [cmn_cost_center]
- Schedule [cmn_schedule]

Desired State

Desired State performs scheduled or on-demand audits of CMDB data to determine which records match the expected attributes, CI relationships, and relationships to other records in the system.

For example, desired state can determine if a computer has a license for a particular software program. The compliance process checks configuration items (CI) to ensure that their attributes and relationships comply with standards set by your organization. Audit results show any discrepancies in the desired state of a record, and ServiceNow automatically assigns follow-on tasks to qualified users who can remediate those discrepancies.

Desired State process

The Desired State application conducts scheduled or on-demand audits of CMDB data to determine which configuration items (CI) match a desired state.

The desired state certification process can mean checking servers to ensure that their physical resources, such as CPU speed or memory, comply with certain standards. This process also ensures that all critical business services have a manager, support group, and approval group assigned.

The administrator responsible for certification creates definitions of desired states and then schedules an audit to check CIs for compliance. The audit results identify CIs that pass certification and itemize the discrepancies in those CIs that fail. The ServiceNow system automatically generates follow-on tasks to track the process of adjusting the CIs to the desired state.

Desired state differs substantially from data certification. Data certification is a manual process to ensure that your data matches reality. Desired state examines the same data and determines when the configuration of each item is in the desired and approved state.

1. Create a certification filter: Create a filter that defines a subset of configuration items to certify. You can create multiple versions of a filter, and then activate the version you want to use for certification. You can create filters on the Configuration Item [cmdb_ci] table and all tables that extend it.

2. Create a template: Create a template with conditions that define the desired state of the physical attributes, related records, and relationships for a CI. The certification filter you select for the template determines which configuration items the system examines.

3. Create and run an audit: Create an audit using the template. Set the audit to run on a schedule or on demand. The audit generates a set of results based on the conditions from the template you specify. Determine usage of follow-on tasks:

   - Determine if the audit creates follow-on tasks and assignment.
• Determine if the same follow-on task is used for the same audit failure across multiple runs. The system attribute glide.allow.new.cert_follow_on_task is set to true by default, allowing for new follow on tasks to be created for the same failure, at each audit run.

4. View audit results: View the audit results which display any discrepancies between the desired state, as specified by the template, and the actual state of the target configuration items.

5. Correct discrepancies: Correct the discrepancies the audit found by completing the follow-on tasks created by the system.

Desired State roles

To access or configure certification elements, a user must have the certification_admin role. These users can create, update, and delete filters if they have the proper access to necessary tables.

In the base system, certification_admin users have limited system rights and do not have access to all the necessary tables. When assigning compliance resources, make sure to grant additional roles to the certification_admin user as needed. For example, the certification administrator requires roles that grant access to these tables:

• Company [core_company]
• Cost Center [cmn_cost_center]
• Schedule [cmn_schedule]

Desired State Overview module

The Desired State Overview module displays various desired state reports. The Overview module is a type of homepage.

The Desired State Overview module is a type of homepage.

Use the Desired State Overview module

The Desired State Overview module displays various desired state reports.

1. Navigate to Compliance Desired State Overview.
2. Move or add reports where needed.
3. Click elements within the reports to obtain more information.

The Desired State Overview Module in the base system contains these reports:

• Upcoming Desired State Audits: All scheduled audits.
• Outstanding Desired State Tasks: All follow-on tasks in the Pending, Open, or Work in Progress state.
• Hierarchical Task Roll Up: All follow-on tasks grouped by Assigned to user.
• Desired State Discrepancies: All audit discrepancies for attributes and relationships.
• 30/60/90 Day Task Aging: All outstanding follow-on tasks grouped by age in 30-day increments.
Desired State Overview module roles

Only compliance users with certain roles can access the Overview module.

The different levels of access are:

Table 46: Access levels per role

<table>
<thead>
<tr>
<th>Role</th>
<th>Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>certification</td>
<td>View (view overview page and refresh reports)</td>
</tr>
</tbody>
</table>
| certification_admin | • View (view overview page and refresh reports)  
|                    | • Customize (refresh, add, delete, and rearrange reports)            |
|                   | View, customize                                                       |
| admin             | • View (view overview page and refresh reports)  
|                    | • Customize (refresh, add, delete, and rearrange reports)            |
|                   | • Edit (can edit reports)                                             |

Access levels

The different levels of access are:

- View: can view the overview page and refresh reports.
- Customize: can refresh, add, delete, and rearrange reports.
- Edit: can edit reports.

Desired State reporting

The Desired State application includes reports to assess your audit results.

These reports are available to all users whose role gives them access to the Reporting application. Users with the admin role can share these reports with specific users of groups or change the display options.

Navigate to Reports View / Run. In the Reports search field, enter all or part of the report name. You can also scroll to the designated category and select one of the reports.

In addition to these reports, you can also generate other reports.
Figure 22: Desired State threshold report
### Table 47: Desired state report table

<table>
<thead>
<tr>
<th>Report</th>
<th>Description</th>
<th>Category</th>
</tr>
</thead>
</table>
| Desired State Discrepancies           | This report displays all desired state audit results that have a follow-on task that is not yet in the Closed Complete state. This report displays by column name.  
  • Type: bar chart  
  • Table: Audit Result [cert_audit_result] | Audit Result     |
| Desired State Result with Stability Unstable | This report displays all audit results where the Stability field has the value Unstable. This report displays by CI and stacked by audit.  
  • Type: bar chart  
  • Table: Audit Result [cert_audit_result] | Audit Result     |
| Desired State Result with Threshold Exceeded | This report displays all audit results where the Threshold field has the value Exceeded. This report displays by CI and stacks by each audit.  
  • Type: bar chart  
  • Table: Audit Result [cert_audit_result] | Audit Result     |
| Upcoming Desired State Audits         | This report displays the desired state audits that are scheduled to run in the next two quarters.  
  • Type: List (tabular) report  
  • Table: Audit [cert_audit] | Audit            |
| 30/60/90 Day Desired State Task Aging  | This report displays the number of follow-on tasks that are not Closed Complete for desired state audit types. The report is grouped by aging level.  
  • Type: Horizontal bar chart  
  • Table: Follow On Task [cert_follow_on_task] | Follow On Task    |
Certification audits

A certification audit compares the actual attributes of certain ServiceNow records. This audit selects a filter, against the expected attributes, relationships, and related record values defined by template conditions or a script.

You can configure the audit to create and assign follow-on tasks to remediate any discrepancies the audit finds. Audit records use a standard ServiceNow scheduler to determine when to run. After an audit runs, the results and follow-on tasks appear in related lists in the audit record.

Users with the certification_admin role can create, update, delete, and run audits. Users with the certification role can view audits, audit results, and follow-on tasks.

Create an audit

Compliance offers two types of audits: one uses templates to define conditions and the other uses a script.

Role required: certification_admin

1. Ensure that an appropriate template record was created for this audit.

   **Note:** Conditions in the template define the values to audit.

2. Use the CI Class Manager:
   a) Navigate to Configuration CI Class Manager.
   b) Click Hierarchy to display the CI Classes list. Select the class for which to create an audit.
   c) In the class navigation bar, expand Health and then click Compliance. Click Audit.

3. Or, navigate to one of these modules:
   • Compliance Audits
   • Compliance Architecture Compliance Audits
   • Compliance Desired State Audits
   • Compliance Scripted Audits Audits
4. Click New.
   The system opens a new record for the audit type associated with the navigation path you selected.
   The Audit type field is read-only.
5. Complete the form using the fields described in the table below.
6. Right-click the header bar and select Save.
   The Audit Results and Follow On Tasks related lists appear on the form.
7. To run the audit immediately, click Run Audit.
   When template audits run, ServiceNow updates the date and time in the Last run date field and
   populates the related lists. For scripted audits, the Last run date field is not populated.
8. View the records that passed and the discrepancies found by the audit in the Audit Results related list.
   You can open template records and any follow-on tasks directly from this related list. Notice that the
   value in the Task description field appears as the Short description in the follow-on tasks.

**Note:** You cannot delete audit records that have audit results or audit results that have follow-
on tasks. ServiceNow disables the Delete option in records and lists where these dependent
records exist.

---

**Table 48: Creating Audits**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name for this audit.</td>
</tr>
<tr>
<td>Filter</td>
<td>Filter to use when the audit type is Scripted. This field is required for scripted audits, but is hidden for all other audit types.</td>
</tr>
<tr>
<td>Template</td>
<td>[Required] Template to use when this audit runs. Audit type filters the list of available templates, and only the active versions of templates are available for selection. For example, when you create an audit from Desired State, only templates of the Desired State audit type are available for selection. For the Desired State and Architecture Compliance audit types, only templates for tables that extend the Configuration Item [cmdb_ci] table are available. This field is hidden when the audit type is Scripted.</td>
</tr>
<tr>
<td>Table</td>
<td>[Read-only] Table for the template.</td>
</tr>
<tr>
<td>Create tasks</td>
<td>Option to create follow-on tasks for correcting discrepancies (selected). In a scripted audit, you can create the logic for either task state by using true to create tasks or false to not create tasks. By default, this check box is cleared (false) in a new audit record.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Assignment type</td>
<td>Method for assigning follow-on tasks. This field is visible only when the Create task check box is selected. Choices are:</td>
</tr>
<tr>
<td></td>
<td>• User Field: Select a user reference field on the table being audited. For example, you choose the user identified in the Managed by field on the failed record to perform the tasks. This selection displays the Assigned to and Assign to empty fields. If the reference field on the record is empty, the value in the Assign to empty field is used.</td>
</tr>
<tr>
<td></td>
<td>• Specific User: Select a specific user to perform the tasks. This selection displays the User field.</td>
</tr>
<tr>
<td></td>
<td>• Group Field: Select a group reference field on the table being audited. For example, you choose the group identified in the Support group field on the failed record to perform the tasks. Tasks are assigned to all members of the group. This selection displays the Assign to group and Assign to empty fields. If the reference field on the record is empty, the value in the Assign to empty field is used.</td>
</tr>
<tr>
<td></td>
<td>• Specific Group: Select a specific group to perform the tasks. This selection displays the Group field. All members of the selected group are assigned to the tasks.</td>
</tr>
<tr>
<td>User</td>
<td>The specific user this audit assigns to follow-on tasks. This user must have the certification role. This field is available under these conditions:</td>
</tr>
<tr>
<td></td>
<td>• Assignment type is set to Specific User.</td>
</tr>
<tr>
<td></td>
<td>• Assign to empty is set to Create Assigned Task, and Assignment type is set to User Field.</td>
</tr>
<tr>
<td>Assign to group</td>
<td>The group field that defines which group this audit assigns to the follow-on task. This field is available only when the Assignment type is Group Field.</td>
</tr>
<tr>
<td>Group</td>
<td>The specific group this audit assigns to follow-on tasks. This field is available only when the Assignment type is Specific Group.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Assign to</td>
<td>The user field that defines which user this audit assigns to the follow-on task. This field is available only when the Assignment type is User Field.</td>
</tr>
</tbody>
</table>
| Assign to empty     | The behavior to use if the field selected in Assign to or Assign to group is blank on the record being audited. For example, if a follow-on task must be assigned to a manager, but no manager is identified, the Assign to empty setting determines what happens. This field appears only when the Assignment type is User Field or Group Field. Choices are:  
  - Do Not Create Task: No follow-on task is created when the Assign to or Assign to group field is empty.  
  - Create Unassigned Task: Create a follow-on task, but do not assign it to any user or group. The task can be manually assigned later.  
  - Create Assigned Task: Create a follow-on task and assign it to the user or group specified. If the assignment type is User Field, the User field becomes available. If the assignment type is Group Field, the Group field becomes available.  
  The audit automatically creates follow-on tasks for all records that have Assign to populated, regardless of the Assign to empty setting. |
| Short description   | Brief description of the purpose of the audit.                                                                                                                                                          |
| Task description    | General description of the work required for the follow-on tasks for the audit. All follow-on tasks created by this audit inherit this description.                                                          |
| Active              | Activation control for this audit record. Clear this check box to prevent this audit from running and creating follow-on tasks.                                                                    |
| Run                 | How often to run the schedule that generates the audit.  
  - Daily  
  - Weekly  
  - Monthly  
  - Periodically  
  - Once  
  - On Demand |
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
</table>
| Day                 | • If Run is Weekly, the day of the week when the audit runs.  
                    • If Run is Monthly, the day of the month when the audit runs. If the day is 29, 30 or 31, for shorter months the audit runs on the last day of the month. |
| Repeat Interval     | If Run is Periodically, the frequency that the audit runs, based on a 24-hr. clock. Enter the number of days between audits and the time of day that you want the audit to run. For example, set Days to 10 and Hours to 14:00:00 to run the audit every 10 days at 2:00pm. |
| Starting            | If Run is Periodically or Once, the date and time when the audit runs. |
| Time                | If Run is Daily, Weekly, Monthly, or Once, the time of day, on a 24-hour clock, when the audit runs. |
| Last run date       | [Read-only] The last date and time the audit ran, either on its regular schedule or manually. Audit previews do not update this field. |
| Next scheduled run  | [Read-only] The next date and time when the audit runs. The system recalculates this field when you change the schedule. |
| Audit type          | [Read-only] The type assigned to this audit. The system selects the audit type based on the application from which the audit is created. The type can be:  
                    • Desired State  
                    • Architecture Compliance  
                    • Compliance  
                    • Scripted |
<p>| Health window       | Duration of the evaluation period for threshold and stability. The health window value defines the number of Health window units in an evaluation period for an audit. This value is expressed as a positive integer. The default value for this field is 7. |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health window unit</td>
<td>Unit of measurement that defines the duration of a health window. The default value for this field is Days. Choices are:</td>
</tr>
</tbody>
</table>
|                       | • Minutes  
|                       | • Hours    
|                       | • Days     
|                       | • Months   |
| Threshold count       | Sets the acceptable number of audit failures for the desired state field that can occur within the specified health window for a CI. The audit results indicate when a desired state field is within or has exceeded this threshold limit. The default value for the threshold is 5. |
| Stability count       | Sets the acceptable number of times that audit results for a CI can switch between Certified and Failed within the specified health window. The audit results for a CI indicate whether it is stable or unstable. The default value for stability is 1. |
| Run this script       | Audit script to run which contains the conditions that a CI need to comply with to pass the audit. This field is available only when the audit type is Scripted. The Audit form includes a sample script with instructions for performing the audit and generating the follow-on tasks. |

### Audit Scheduling

The system performs audits automatically from the schedule you configure.

Users with the certification_admin or admin role can generate on-demand audits directly from the Audit form by clicking Run Audit. When an audit runs, ServiceNow populates the Audit Results related list in the form and shows follow-on tasks, if any, in the Follow On Tasks related list. Click Preview Audit Results to generate an audit preview that tests your template conditions without generating any audit results.
Audit results show the records that have passed or failed an audit and itemize any discrepancies detected. A discrepancy is considered any departure from the expected conditions defined in the template or script used for the audit. Audit results provide links to the source records and to the follow-on tasks for bringing failed records into compliance. Records that pass an audit have a single entry in the results table with a state of Certified. Records that fail an audit show all discrepancies, each with a state of Failed.

ServiceNow displays results from a certification audit in these locations:

- Audit Results list
- A related list in the Audit record
- A related list in the compliance view of a CI record
View an audit result

To generate certification results, you must first create and run an audit.

1. Navigate to one of the following locations:
   - Compliance Desired State Audit Results
   - Compliance Architecture Compliance Audit Results
   - Compliance Scripted Audits Audit Results
   - Data Certification Schedules Audit results

2. From any audit results list, you can edit the filter to show the results for any audit type.

   ![Audit Type filter]

   Figure 24: Audit Type filter

   The results filter by audit type and grouped by audit number. Within the groups, results list by date, from oldest to newest.

3. You can open the audit record, the CI record, or the follow-on tasks from this list.

   **Note:** The Audit type field was set automatically when the audit result was created and cannot be changed. For scripted audits, the audit type is set when you create the audit record.
Figure 25: Desired State Audit Results

Audit results show this information:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Created</td>
<td>Date and time the audit ran.</td>
</tr>
<tr>
<td>Document</td>
<td>Record that was certified, such as a configuration item (CI).</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>State</td>
<td>Results of certification for each condition evaluated. The three possible states are:</td>
</tr>
<tr>
<td></td>
<td>• Certified A certified record is one that passed all conditions. ServiceNow generates only one audit result for a certified record.</td>
</tr>
<tr>
<td></td>
<td>• Failed Records that are not certified have an audit result for each failed condition. The Column name, Desired value, Discrepancy value, and Follow on task are only populated for failed results.</td>
</tr>
<tr>
<td></td>
<td>• Pending A pending state indicates that the audit is incomplete. Data certification audits use this state when a result is awaiting user input.</td>
</tr>
<tr>
<td>Column name</td>
<td>Audited field, relationship, or related list column that did not match the expected state.</td>
</tr>
<tr>
<td>Desired value</td>
<td>Attribute or relationship required for this record that was not found, from the condition in the expected state template. For data certification, this column is blank if the record has a state of Failed or Pending.</td>
</tr>
<tr>
<td>Discrepancy value</td>
<td>Actual value of the attribute that did not match the expected state. The follow-on task, if provided, tracks resolution of this discrepancy. In a list of results for the Data Certification audit type, this column is blank if the record has a state of Certified or Pending.</td>
</tr>
<tr>
<td>Follow on task</td>
<td>Link to the follow-on task generated for remediating a discrepancy. Adam.</td>
</tr>
<tr>
<td>Audit</td>
<td>Link to the audit record that produced the results.</td>
</tr>
<tr>
<td>Threshold</td>
<td>State of an audited, desired state field with a defined failure threshold. This threshold is the acceptable number of failures for a desired state field within a specified health window and is configured in the Audit form. Possible threshold states for the results are:</td>
</tr>
<tr>
<td></td>
<td>• In Limit</td>
</tr>
<tr>
<td></td>
<td>• Exceeded</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Stability</td>
<td>Stability state of a CI. Stability state is based on the number of times the audit result for a desired state field changes from Certified to Failed within a specified health window. Possible stability states are:</td>
</tr>
<tr>
<td></td>
<td>• Stable</td>
</tr>
<tr>
<td></td>
<td>• Unstable</td>
</tr>
</tbody>
</table>

Delete an audit result

While audit results can be deleted, you cannot delete an audit result that has a follow-on task associated with it.

1. Navigate to one of these modules:
   - Compliance Desired State Audit Results
   - Compliance Architecture Compliance Audit Results
   - Compliance Scripted Audits Audit Results

   The list groups by audit name.

2. Select the checkbox for a result in the list, and then select Delete from the Actions on selected rows menu at the bottom of the list.

   **Note:** If the result record has a follow-on task, the Delete option is not available. If you select multiple records, some with and some without tasks, the system only deletes those records that do not have tasks.
3. Click a date/time link to see the results for a specific CI.

   **Note:** The Delete button only appears on the form if the audit result does not have a follow-on task.

4. Click Delete.

---

**Figure 26: Audit Result Delete List**

**Figure 27: Audit Result Delete Available**
View an audit result in the Compliance view

After an audit has run, you can view the results and follow-on tasks from the Compliance view in the records of every CI audited.

This view is available only for systems that use the default CI classes provided with the base ServiceNow system, such as Hardware, Software, and Computer. For information about creating views, see View Management.

1. Navigate to Configuration and open the record of a CI that was included in a compliance audit.
2. Select the view to configure by performing the appropriate action for your list version.

<table>
<thead>
<tr>
<th>Version</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>List V2</td>
<td>Open the context menu and select View Compliance.</td>
</tr>
<tr>
<td>List v3</td>
<td>Open the context menu and select Change View, and then click Compliance.</td>
</tr>
</tbody>
</table>

Figure 28: List v2: select View Compliance

The Audit Results Compliance View appears.
Figure 29: Audit Results Compliance View

Table 50: Audit Results Compliance View List Descriptions

<table>
<thead>
<tr>
<th>Lists</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passed Audit Results</td>
<td>Lists audits for this CI that passed without discrepancies. The information includes the versions of the template and filter used. Records are grouped first by audit, and then by creation date and time.</td>
</tr>
<tr>
<td>Failed Audit Results</td>
<td>Lists all failed audits for this CI. The information includes the discrepancy data, the follow-on task, and the versions of the template and filter used. Records are grouped first by audit, and then by creation date and time.</td>
</tr>
<tr>
<td>Follow On Tasks</td>
<td>Lists all follow-on tasks generated from audit discrepancies for this CI.</td>
</tr>
</tbody>
</table>

3. Right-click the header bar and select View Compliance from the context menu.
Results preview

You can preview an audit to view potential results without saving audit results or generating follow-on tasks. For example, use this feature to test template conditions for correctness without creating thousands of result records.

In an audit record, click Preview Audit Results under Related Links.

![Audit Preview](image1)

Figure 30: Arch Comp Audit Preview

A summary of the potential audit results appears at the top of the audit record. Previewing does not change the Last run date field.

![Audit Preview Message](image2)

Figure 31: Arch Comp Audit Preview Message
Health windows

A health window is a trailing time frame in which the ServiceNow system evaluates audit results from CIs that have desired state fields defined.

The Health window and Health unit fields define each window, and ends when an audit runs. For example, an audit runs on the fifteenth of the month with a seven-day window. It evaluates the threshold values of a desired state field from the eighth to the fifteenth. When the same audit runs the next day, the system evaluates the threshold from the ninth to the 16th, and so on. The audit counts backward seven days from the current day. ServiceNow evaluates a CI threshold value for each health window, without considering the results from the previous window. As a result, the health of a CI can fail for one audit and then pass in a subsequent audit that runs in a new window.

ServiceNow evaluates stability by recording the number of times a desired state threshold value for a CI switch between Failed and Certified within the health window. In the example shown here, a 5-minute health window was set for the desired state field on a UPS unit that measures the remaining battery time. The threshold was set at 2, which allows the field to fail two audits in the same health window.

![Figure 32: Desired State Health Window](image)

In the initial audit, the system evaluated the threshold value for the Seconds on battery field within a 5-minute window. This window ran from 13:52:51 to the time of the audit at 13:57:51. The desired state field showed In Limit for that audit and the second audit conducted less than a minute later. The next two audits were conducted within five minutes of the first audit and both showed that the threshold (set at 2) was Exceeded. A subsequent audit was conducted five minutes after the audit in which the desired state field threshold was first exceeded. Since the health window had moved forward enough units, the Seconds on battery field was within limits again with only one failure in the 5-minute window being evaluated.
Figure 33: Desired State Health Results

Copy an audit

New audits can be created from an existing audit.

1. Open the audit record you want to copy.
2. Change the name or short description to distinguish this audit from the original.
3. Make any other changes you need.
4. Right-click in the header bar and select either Insert or Insert and Stay from the context menu.
The system clears the Last run date field and inserts the record into the database.

Certification filters

A certification filter creates a subset of ServiceNow records to audit, typically from configuration items (CI) of a certain type, such as all UNIX servers in a specific datacenter.

However, you can define a filter for any ServiceNow table by using any set of system-supported conditions. Audited records identified by a filter for expected attributes or relationships, depending on the audit type.

You can create multiple versions of a filter, reactivate inactive versions, and select the version you want to use in a template or a certification schedule. Only the active versions of a filter are available for selection in template records. You can use a single filter for multiple certification templates or schedules.

Table 51: Certification filters

<table>
<thead>
<tr>
<th>Filter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Certification</td>
<td>Validates CMDB data.</td>
</tr>
<tr>
<td>Filter</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Architecture Compliance</td>
<td>Manages reviews of CMDB data in architecture compliance audits to determine which configuration items (CIs) match expected attributes.</td>
</tr>
<tr>
<td>Desired State</td>
<td>Manages reviews of CMDB data to determine which CIs match a desired state for both attributes and relationships.</td>
</tr>
<tr>
<td>Compliance</td>
<td>Manages reviews of records from any ServiceNow table to determine which records match an expected set of attributes and related record conditions.</td>
</tr>
<tr>
<td>IT Governance Risk and Compliance</td>
<td>Generates audits and tests to ensure that controls are being followed and creates tasks to track corrective actions.</td>
</tr>
</tbody>
</table>

**Compliance filter**

The compliance filter for license bases uses the following fields to define entitled users or CIs. These field values can be used independently or together to calculate compliance.

**Table 52: Compliance Filter**

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entitled company</td>
<td>All users or configuration items (CI) at all locations of this company, in all departments are entitled to use this software package. Compliance at this level calculates how many licenses are purchased for the company at large and how many entitled users or CIs consume them.</td>
</tr>
<tr>
<td>Entitled location</td>
<td>CIs and users who are assigned to this company location in any department are entitled to use this software package. Compliance at this level calculates how many licenses are purchased for this company location and how many users and CIs consume them.</td>
</tr>
<tr>
<td>Entitled department</td>
<td>Only the users or CIs in this department at this company location are entitled to use this software package. Compliance is calculated for a single department only.</td>
</tr>
</tbody>
</table>

The license form can display information about all CIs or named users who are using this software package. The form indicates when license reconciliation is necessary and displays all compliant users or CIs.

Possible compliance levels are:
<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non applicable</td>
<td>Compliance levels for all infrastructure licenses that are related to cluster licenses are set to Non applicable automatically. Compliance levels are calculated in the cluster license only, and not in the related infrastructure licenses.</td>
</tr>
<tr>
<td>Out of compliance</td>
<td>More licenses are being consumed than were purchased. There are more users or CIs using this license than the license allows, and some users or CIs are not be entitled to use this software package.</td>
</tr>
<tr>
<td>Unused</td>
<td>The licenses for this software package are currently unused.</td>
</tr>
<tr>
<td>Reconciliation required</td>
<td>CIs or users who are not entitled to use this software are consuming licenses. Licenses that require reconciliation are considered out of compliance. Reconciliation requires action to ensure that unentitled users are not using the software. Reconciliation involves uninstalling software or increasing license counts to match actual user counts.</td>
</tr>
<tr>
<td>Nearly out of compliance</td>
<td>For a software package to be at this compliance level, more than 95% of the licenses are in use by entitled users or CIs. License bases at this level are considered to be In compliance.</td>
</tr>
<tr>
<td>In compliance</td>
<td>This software package has unused licenses. All users or CIs using a license are entitled to use this software package.</td>
</tr>
</tbody>
</table>

Copy a filter

New filters can be created from an existing filter.

1. Open the filter record you want to copy.
2. Make sure to change the filter name or description to distinguish the new filter from the original.
3. Make any other necessary changes.
4. Right-click in the header bar and select either Insert or Insert and Stay from the context menu.
The system increments the record number and sets the version to 1 for the new record. Both the original filter and the copy are Active and appear in the record list. Showing all copies of a filter allows you to see the entire history of the filter.

Figure 36: Desired State Filter Insert
Additional Roles

In the base ServiceNow system, users with the certification_admin role have limited system rights and do not have access to the tables required for creating a filter.

When assigning compliance resources, make sure certification_admin users have any additional roles they need. For example, a user requires roles that grant access to the Company [core_company] table.

Filter versions

Versions can be displayed in a list.

The default list of filters displays only the active version of each filter. To see all filter versions in the list view, select All in the breadcrumbs.

Create a filter

You can create as many versions of a filter as necessary. You can then designate which versions are active and available for selection in Compliance template records, Governance Risk and Compliance control test definitions, or Data Certification schedule definitions.

1. Navigate to Configuration CI Class Manager, and:
   a) Click Hierarchy to display the CI Classes list. Select the class to create a filter for.
   b) In the class navigation bar, expand Health and select Compliance. Then click Certification Filter.
2. Or, navigate to one of these modules:
   • Compliance Filters
   • IT GRC Administration Filters
   • Data Certification Schedules Certification Filters
3. Select an existing filter to edit, or click New.
4. Fill in the fields (see table below).
5. Click Submit.
   This action saves the filter as version 1.
6. To create another version of this filter, open the record and modify the name, table, or conditions.
7. Click Update.

The system saves a new version of the current filter and makes it the Active version. The previous version is marked inactive. The system displays only active filter versions for selection when you create templates or schedules.

Table 54: Creating Filters

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>[Read-only] Displays the automatically assigned filter identification number. All versions of a filter have the same number.</td>
</tr>
<tr>
<td>Name</td>
<td>[Required] Filter name.</td>
</tr>
<tr>
<td>Description</td>
<td>[Optional] Describes this filter. You can change the description of a filter without incrementing a version.</td>
</tr>
<tr>
<td>Table</td>
<td>Specifies the table containing the records to select. The template or schedule that uses this filter works on this table. For example, select the ESXi Server [cmdb_ci_esx_server] table to select VMware ESX servers.</td>
</tr>
<tr>
<td>Active</td>
<td>Makes this filter available for use from the Filter field on the Certification Template or Schedule Definition form. Multiple versions of a filter can be active. You can activate or deactivate a filter without incrementing the version.</td>
</tr>
<tr>
<td>Version</td>
<td>[Read-only] Indicates the version of this filter. Any changes to this filter, except to the description or the Active check box, makes it inactive. The system increments the version of the updated filter and marks it as active. The system saves all versions of the filter and makes them available for reactivation.</td>
</tr>
<tr>
<td>Filter condition</td>
<td>Specifies the fields, operators, and values that create the filter. The available fields are based on the table selected. The condition builder shows the number of records that match the conditions. Click the refresh icon to recalculate the number of matching records when you edit the conditions.</td>
</tr>
</tbody>
</table>
Delete a filter

Only users with the certification_admin or admin role can delete filter versions. But, you cannot delete a filter that is being used in a template or a scripted audit.

You cannot delete a filter that is being used in a template or a scripted audit.

1. To delete a single filter version, open that version record and click Delete.

   The system hides the Delete button for filters that are in use. If you delete the latest version of a filter that is active, the previous version of that filter is reset to Active.

2. To delete all unused and inactive versions of a filter, open any version of that filter and click Delete inactive versions under Related Links.

3. When prompted, click OK to proceed.

   The system deletes unused filter versions. A message in the header bar identifies filter versions that cannot be deleted because they are used in a template or scripted audit.
Manage a filter version in a form

You can view and manage all versions of a filter from the Certification Filter form.

1. Open any version of a filter.
   The Other Versions related list displays all other versions of this filter, both active and inactive. The system prevents you from editing either the filter version or the record number in the list view.
2. Click any version in the related list to display the record for that version.
3. To make an inactive filter the current version, open the filter, edit it if desired, and then click Revert.
   This action:
   • Deactivates the previous active version of the filter.
   • Copies the inactive filter.
   • Makes this new copy current and active.
Certification follow-on tasks

The ServiceNow system can automatically generate and assign follow-on tasks to correct discrepancies detected during compliance audits.

The system attribute glide.allow.new.cert_follow_on_task is set to true by default, allowing for new follow-on tasks to be created for the same failure, at each audit run. You can set this property to false, to configure audit to use the same follow-on task for the same audit failure across multiple runs.

You configure and assign follow-on tasks to qualified users or groups in the audit record. A user with the certification_admin role can reassign any follow-on task. The Audit Results related list in the Follow On Task form contains links to the records that failed.

Access follow-on tasks

Users with the certification role can only access follow-on tasks assigned to them but can reassign these tasks to other users.

1. Navigate to Compliance My Follow On Tasks.
   - The list contains all active follow-on tasks assigned to the logged in user.
Figure 42: Follow-on Task My Work

2. Open a task.

The record shows the specifics of the task, the task activity, and the failed audit results.
Figure 43: Follow-on Task
3. Open records from the Audit Results related list to see each discrepancy.

![Audit Result Detail](image1.png)

**Figure 44: Audit Result Detail**

4. Go to the CI named in the record and perform the work to bring it into compliance.

5. Update the State field in the follow-on task record and add work notes as you correct each discrepancy.

When you change the state, the system updates the task activity appropriately.

![Follow-on Task Activity](image2.png)

**Figure 45: Follow-on Task Activity**

When the task is Closed Complete it no longer appears on the My Work list.
Manage follow-on tasks

Users with the certification_admin or admin role can see all follow-on tasks.

Tasks are pre-assigned to a user or group as specified in the audit record, but users with the certification_admin role can reassign the task.

1. Navigate to the appropriate application:
   - Compliance Architecture Compliance Follow On Tasks
   - Compliance Desired State Follow On Tasks
   - Compliance Scripted Audits Follow On Tasks

   The list of follow-on tasks appears, filtered by audit type.

![Figure 46: Arch Comp Task Audit Type](image)

2. Open a task.
   The Audit and Configuration item fields are read-only for all users.

3. Edit the Assignment group or the Assigned to field if necessary.

4. Edit the Short description field if necessary.
   The short description is inherited from the Task description field in the Audit form.
5. Use the links in the Audit Results related list to open the individual records that failed the audit.
6. If you update the follow-on task record, be sure to add work notes.

**Certification templates**

Certification templates can define attributes, relationships, and reference field values that indicate what a record is expected to contain.

These values are used to perform audits on ServiceNow records. The certification filter selected in the template identifies the table and records to audit, and the template conditions set the expected state for those records. The type of audit you create determines which tables and template conditions are available.

Users with the certification_admin role can create, update, and delete templates. Users with the certification role can view template versions.
Certification template audit types

When you create a template, ServiceNow assigns an Audit type that determines which tables and conditions are available in the certification template. This value is based on the application from which the template is created. Each application lists only the templates with the associated type.

Available Condition Builders

The available condition builders for each audit type:

- **Compliance**: Runs audits on any set of ServiceNow records, not only configuration items (CI). This audit type provides the following types of conditions for any ServiceNow table:
  - Attribute: Sets conditions for the attributes of the records.
  - Related List: Runs audits on records in tables that reference the table defined in the template.

- **Architecture Compliance**: Defines the following types of conditions for tables that extend the Configuration Item [cmdb_ci] table.
  - Attribute: Sets conditions for physical attributes of CIs, such as memory or disk size.
  - Related List: Runs audits on records in tables that reference the table defined in the template.

- **Desired State**: Defines the following types of conditions for tables that extend the Configuration Item [cmdb_ci] table.
  - Attribute: Sets conditions for physical attributes of CIs, such as memory or disk size.
  - CI relationship: Defines the relationships these CIs have with other CIs. An example of a relationship is a business service, such as Outlook Web Access, that depends on a server.
  - User relationship: Defines the user who reviewed the log records. The only operator available with this condition builder.
  - Group relationship: Defines user groups who backed up this CI. The only operator available with this condition builder.
  - Related List: Runs audits on records in tables that point toward the table defined in the template.

Create or edit a certification template

To create a certification template, follow these instructions.

Activate the Certification Core plugin to enable the Compliance functionality. See Compliance Activation on page 266 for details.

1. Ensure that you have an appropriate filter that defines the records the template evaluates.
   The template applies its conditions to these records.
2. Use the CI Class Manager to navigate to the Certification Template form:
   a) Navigate to Configuration CI Class Manager.
   b) Click Hierarchy to display the CI Classes list. Select the class for which to create a certification template.
   c) In the class navigation bar, expand Health and then click Compliance. Click Certification Template.
3. Or, navigate using one of these paths:
   - Compliance Architecture Compliance Templates
   - Compliance Desired State Templates
• Compliance Templates
• IT GRC Audit Definitions Templates

4. Click New or select a certification template to edit.

The following fields are completed automatically:

• Number: Each new template has a unique number. All versions of the same template use the same number.
• Active: All new templates are set to Active.
• Version: The version of a new template is set to 1.
• Audit type: The system sets the default type to Architecture Compliance, Desired State, or Compliance, depending on the application in which the template was created. You can select a different type when you create the template, but the field becomes read-only when you submit the record. The system uses audit types to filter record lists for appropriate data and determine which conditions are visible on the template form.

5. Complete the following mandatory fields:

• Name: Enter a descriptive name for this template. The name helps identify the purpose.
• Filter: Select the filter that identifies the records to be certified. You can select either active or inactive filter versions. By default, the system presents only active versions for selection. If you start typing the name of a filter, the auto-complete feature displays all versions for selection. For architecture compliance and desired state templates, only filters that use a table extended from Configuration Item [cmdb_ci] appear on the choice list. All filters appear on the choice list for a compliance template. After you select a filter, the template condition builder appears. The template operates on the table specified in the filter.

Figure 48: Filter Field

6. Enter a Description for this template

7. Define certification conditions using the condition builders. All conditions are AND conditions.

The audit type of the template determines which conditions are available.

• Certification Attribute Conditions: [All audit types] Select configuration item attributes or specifications to certify, such as CPU count, memory, or disk space. Available fields in the attribute condition builder depend on the table from the filter. Typical ServiceNow conditions for attributes are available, including the between operator for setting numerical conditions with high and low boundary values. This operator was added specifically for desired state conditions.

The Show Related Fields item supports dot-walking, allowing you to include referenced fields in a certification attribute condition. Click Show Related Fields or Remove Related Fields to add or remove referenced fields (in the form of `<field> => <field>`). Select a referenced field to drill down to the next level of referenced fields.

See Selecting fields on related tables using dot-walking.
- Certification CI Relationship Conditions: [Desired State audit types] Define the CI relationships to certify, such as Runs on or Depends on.
- Certification User Relationship Conditions: [Desired State audit types] Select the desired user relationship for this configuration item. The relationship provided in the base system is Log reviewed by.
- Certification Group Relationship Conditions: [Desired State audit types] Select the desired group relationship for this configuration item. The relationship provided in the base system is Backed up by.
- Certification Related List Conditions: [All audit types] Select field values from tables that reference the template table, or user-defined related lists which are created via custom relationships in the sys_relationship table. To create a condition that evaluates all servers in the Server [cmdb_ci_server] table for the presence of Microsoft Word 2007, as referenced in the Software Installation [cmdb_sam_sw_install] table. The resulting condition is [Software Installation->[Installed on] [Display name] [is] [Microsoft Word 2007].

Check All to include all records in the condition requirements of the related list. If there are no records in the related list, then:
- If All is checked, the condition requirement is met.
- If All is unchecked, the requirement is not met.

**Note:** By default, the condition builders for relationships display only suggested relationships. To see all possible relationships, select the Show all relationships check box on the right side of the form.

**Figure 49: Clear Check**

![Clear Check Box](image)

**Box**

a) Click Insert a new row to insert a condition. You cannot insert an empty condition.
b) Click the green check mark icon to save a condition. Make sure to save the condition before performing any other operation. Updating the form does not save the condition.

c) To delete a condition, click the red X beside the condition. The system marks the condition as inactive.
The system marks the condition as inactive.

d) To reactivate a condition, click the gray X. If another condition for the same field exists, the system prevents reactivation and warns you of the conflict.

8. Click Submit.
ServiceNow saves the template as version 1.

9. To create another version of this template, change the name, edit the conditions, or select a different filter. Updating the template Description does not create a new version.

   Note: If you select a filter whose table is incompatible with the existing template conditions, the system displays a warning that the conditions cannot be applied.

   Some template conditions are incompatible with the selected filter. Incompatible conditions will not be used for auditing.

10. Click Update.
The system saves a new version of the current template and makes it the Active version. The previous version is marked inactive.

Certification Template Record List

The default Templates list displays only the active version of each template, but users can update the breadcrumbs to display all template versions.

Default Templates List

The default Templates list displays only the active version of each template, filtered by Audit type.
Figure 51: Default Template

All Template Versions

To view all template versions for an audit type, click the arrow before Active=true to remove that condition from the breadcrumbs.
Figure 52: All Template Versions

Manage Certification template versions

You can view and manage all versions of a template from the Template form.

1. Open any version of a template.
   The Other Versions related list displays all other versions of this template, both active and inactive.
2. Click any version in the related list to display the record for that version.
3. Update the template to create a new version. The system increments a version of the template when you edit any field except Description and Active. You can manage the template versions without returning to the list view.
### Other Templates

**Number:** TEM5001092  
**Name:** ESX Server Attributes - UK  
**Description:** Attributes for all ESX servers in the UK office  
**Filter:** ESX Servers - UK/DEV2  
**Table:** cmdt_ci_esx_server  
**Version:** 3  
**Audit Type:** Desired State

#### Certification Attribute Conditions

**Condition**
- “CPU count” is “2”
- “Disk space (GB)” greater than “40”
- “RAM (MB)” greater than “2000”

#### Certification CI Relationship Conditions

**Condition**
- Insert a new row...

#### Certification User Relationship Conditions

**Condition**
- Insert a new row...

#### Certification Group Relationship Conditions

**Condition**
- Insert a new row...

### Related Links

#### Delete inactive versions

**Other Versions**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Filter</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESX Server Attributes - UK</td>
<td>Attributes for all ESX servers in the UK office</td>
<td>ESX Servers - UK/DEV2 - 3</td>
<td>2</td>
</tr>
<tr>
<td>ESX Server Attributes - UK</td>
<td>Attributes for all ESX servers in the UK office</td>
<td>ESX Servers - UK/DEV2 - 3</td>
<td>1</td>
</tr>
</tbody>
</table>

Select versions to display
4. To make an inactive template the current version, open that version, edit it if desired, and then click Revert.
### Certification Template

**Number:** TEM0001003  
**Name:** ESX Servers at HQ  
**Description:** All ESX Servers at HQ  
**Filter:** ESX Filter - 1  
**Table:** cmdb_ci_esx_server  
**Version:** 1  
**Audit type:** Desired State

#### Certification Attribute Conditions

<table>
<thead>
<tr>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Disk space (GB)&quot; greater than &quot;$200&quot;</td>
</tr>
<tr>
<td>&quot;RAM (MB)&quot; greater than &quot;$8000&quot;</td>
</tr>
</tbody>
</table>

Insert a new row...

#### Certification CI Relationship Conditions

Insert a new row...

#### Certification User Relationship Conditions

Insert a new row...

#### Certification Group Relationship Conditions

Select an inactive version as the current version

Choose a version

- **Revert**
- **Delete**

**Related Links**

Delete inactive versions
This action does:

- Deactivates the previously active version of the template.
- Copies the inactive template.
- Makes the new copy the current, active version.

5. Select the Audits related list to view all audits configured to use this template.

![Figure 55: Template Audits Related List](image)

6. Click New to create a new audit record with the template selection and table pre-populated.

Clone a Certification template

New templates can be cloned from an existing template.

1. Open the template record to be copied.
2. Make any necessary changes.
3. Change the template name or description to distinguish it from the original.
4. Click Clone.
   ServiceNow increments the record number above the highest template number and sets the version of the new record to 1. A message appears under the header bar naming the source record for the clone.
Figure 56: Desired State Template Clone

Both templates are Active and appear in the record list. The record list allows you to see the entire history of the template.
Delete a Certification template

Certification templates can be deleted.

Only users with the certification_admin or admin role can delete template versions. You cannot delete a template version that is being used for an audit.

1. To delete a single template version, open that version record and click Delete.
   
   The system hides the Delete button for templates that are in use. If you delete the latest, active version of a template, the previous version of that template is reset to Active.

2. To delete all unused and inactive versions of a template, open any version of that template and click Delete inactive versions under Related Links. This control appears on all versions, whether they are used in an audit.
3. When prompted, click OK to proceed. The system deletes only template versions that are not used in an audit. All protected versions are named in a message that appears in the header bar.

Figure 59: Used Template Delete

Controls and tests management

After you identify the risks, define controls with accompanying control tests to prevent issues from occurring.

This diagram illustrates the entire IT GRC control process.
Figure 60: ITGRC Control Process
Define a control

Define a control before you define a control test.

1. Navigate to IT GRC Controls All.
2. Click New.
3. Fill in the form, as appropriate (see table).
4. Click Submit.

![Figure 61: ITGRC Control](image)

Table 55: Defining A Control

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control ID</td>
<td>A unique identifier generated dynamically by the system.</td>
</tr>
<tr>
<td>Name</td>
<td>A name for the control.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Applies to</td>
<td>Number of a record from any table in the system. This value defines the scope of the control.</td>
</tr>
<tr>
<td>Classification</td>
<td>The type of control.</td>
</tr>
<tr>
<td>Purpose</td>
<td>The approach that the control takes.</td>
</tr>
<tr>
<td>Control frequency</td>
<td>The basis for determining when the control is implemented.</td>
</tr>
<tr>
<td>State</td>
<td>A workflow field that determines where in the authoring process the control is.</td>
</tr>
<tr>
<td>Key control</td>
<td>Indicator that the control is considered key to preventing material risk, when selected.</td>
</tr>
<tr>
<td>Owning group</td>
<td>A reference to the group with ownership over the control.</td>
</tr>
<tr>
<td>Owner</td>
<td>A reference to the user with ownership over the control.</td>
</tr>
<tr>
<td>Owner delegate</td>
<td>A reference to the user who has ownership over the control when the specified owner is unavailable.</td>
</tr>
<tr>
<td>Description</td>
<td>A long-form description of the control.</td>
</tr>
</tbody>
</table>

**Define a control test**

After you define a control, create control tests that run periodically and provide documented evidence of whether the associated control is operating correctly.

1. Navigate to IT GRC Administration Control Test Definitions.
2. Click New.
3. Fill in the form, as appropriate (see table).
4. Click Submit.
Figure 62: IT GRC Control Test Def
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition ID</td>
<td>A unique identifier generated dynamically by the system.</td>
</tr>
<tr>
<td>Name</td>
<td>The name of the control test.</td>
</tr>
<tr>
<td>Control</td>
<td>A reference to the control being enforced.</td>
</tr>
<tr>
<td>Method</td>
<td>One of the following choices for determining the test assignee:</td>
</tr>
<tr>
<td></td>
<td>• Assign to Group: Assignment group for the control test.</td>
</tr>
<tr>
<td></td>
<td>• Assign to Individual: User assigned to the control test.</td>
</tr>
<tr>
<td>Assign to group</td>
<td>Group assigned to this control test. This field is available only when the selected method is Assign to Group.</td>
</tr>
<tr>
<td>Assign to</td>
<td>User assigned to this control test. This field is available only when the selected method is Assign to Individual.</td>
</tr>
<tr>
<td>Remediation group</td>
<td>Group assigned to the remediation tasks when a control test fails.</td>
</tr>
<tr>
<td>State</td>
<td>A workflow field to indicate where in the drafting process this control test currently is. If the state is Active, control test instances are dynamically generated based on the record definition.</td>
</tr>
<tr>
<td>Run</td>
<td>Frequency for generating control test instances. Choices are:</td>
</tr>
<tr>
<td></td>
<td>• Daily</td>
</tr>
<tr>
<td></td>
<td>• Weekly</td>
</tr>
<tr>
<td></td>
<td>• Monthly</td>
</tr>
<tr>
<td></td>
<td>• Periodically</td>
</tr>
<tr>
<td></td>
<td>• Once</td>
</tr>
<tr>
<td></td>
<td>• On Demand</td>
</tr>
<tr>
<td>Time</td>
<td>The time that a control test instance is automatically generated when Run is set to Daily, Weekly, Monthly, or Periodically.</td>
</tr>
<tr>
<td>Day</td>
<td>Day of the week that a control test instance is generated each week when Run is set to Weekly. Day of the month if Run is set to Monthly.</td>
</tr>
<tr>
<td>Repeat interval</td>
<td>A duration, in days and hours, between the automatic generation of control test instances if Run is set to Periodically.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Starting</td>
<td>The date and time control test instances are first generated when Run is set to Periodically. The only date and time a control test instance is generated if Run is set to Once.</td>
</tr>
<tr>
<td>Execution step</td>
<td>The steps involved in the control test.</td>
</tr>
<tr>
<td>Expected result</td>
<td>The result that occurs after these tests.</td>
</tr>
<tr>
<td>Include supporting data</td>
<td>Indicator whether sample data is taken from a particular table within the instance when the control test instance is generated.</td>
</tr>
<tr>
<td>Data purpose</td>
<td>The purpose of the data being sampled If Include supporting data is selected. This selection influences how the control test is performed. Choices are:</td>
</tr>
<tr>
<td></td>
<td>• None</td>
</tr>
<tr>
<td></td>
<td>• Support test execution: Returns a random sampling of records.</td>
</tr>
<tr>
<td></td>
<td>• Identifies non compliance: Returns all the records that do not match the condition or conditions specified.</td>
</tr>
<tr>
<td></td>
<td>• Identifies compliance: Returns all the records that do match the condition or conditions specified.</td>
</tr>
<tr>
<td>Table</td>
<td>The table from which to sample when Include supporting data is selected. This field is read-only when Template is the Condition type. When you select a template to define test conditions, the certification filter used in the template sets the table and cannot be changed.</td>
</tr>
<tr>
<td>Fields</td>
<td>The list of fields to pull values from when determining whether records match the conditions when Include supporting data is selected.</td>
</tr>
<tr>
<td>Condition type</td>
<td>The type of conditions applied to the table and fields. Choices are:</td>
</tr>
<tr>
<td></td>
<td>• Basic: Applies conditions to the table in question.</td>
</tr>
<tr>
<td></td>
<td>• Advanced: Uses condition collections to apply conditions to the table and to related tables.</td>
</tr>
<tr>
<td></td>
<td>• Template: Uses certification templates to apply conditions to the specified table. Select the template to use from the Template field.</td>
</tr>
</tbody>
</table>
### Field | Description
--- | ---
**Sample size** | An integer number of rows for a random sample if Include supporting data is selected. A sample size of zero returns all matching records. This field is available only if Condition type is set to Basic and Data purpose is set to Support test execution.

**Control test conditions** | A condition builder that limits the sample data when Include supporting data is selected. This field is available only if Condition type is set to Basic.

**In scope definition** | A reference to a condition collection if Include supporting data is selected and Condition type is set to Advanced.

**Configuration to retrieve** | Method for using the Configuration reference field if Include supporting data is selected and Condition type is set to Advanced or Template.

- **None**: Returns all records in scope.
- **Matching**: Returns all matching records in scope.
- **Non-matching**: Returns all non-matching records in scope.

For more information, see Defining Advanced Conditions.

**Template** | [Required] Certification template that defines conditions for this test definition. Only templates with an audit type of Compliance are available for selection. This field is available and mandatory when the value in the Condition type field is Template.

**Configuration** | Condition collection to use. This field is available only if Include supporting data is selected. Condition type is set to Advanced, and Configuration to retrieve is set to anything except None.

---

**Advanced conditions**

Set the Condition type to Advanced on control tests to define more flexible conditions using condition collections.

Condition collections have one primary condition, which is applied to the selected table, and one or more supplemental conditions.

When a control test is performed, advanced conditions evaluate in this order:

1. The system processes the condition collection in the In scope definition reference in this order:
   a. The primary condition is processed on the fields specified in Table and Fields on the control test definition, returning an array of elements.
b. For each element in the array returned by the primary condition, supplemental conditions are processed, filtering the array of elements further.

c. The In Scope field is updated with the number of elements in the array.

2. The condition collection in the Configuration reference is processed on the array of elements returned from the In scope definition. The choices for Configuration to retrieve are:
   - None: These conditions are skipped. Supporting Data is all the elements that are in scope.
   - Matching: The control test checks the array of elements, returning any elements that match the Configuration.
   - Non-matching: The control test checks the array of elements, returning any elements where at least one condition did not match the Configuration.

3. The final array of elements is recorded as Supporting Data records.

Both the In Scope and Configuration fields refer to the Condition Collection [grc_condition_collection] table.

To define condition collections:
1. Navigate to IT GRC Administration Condition Collections.
2. Click New.
3. Populate these fields:
   - Name: Name of the condition collection.
   - Description: Description of the condition collection.
   - Type: Which Control Test Definition field references the condition collection. Choices are:
     - In Scope Definition
     - Configuration Definition

4. After the condition collection is defined, use the Add Condition related link to add these conditions:
   - Condition: Predefined condition definition from the Condition [grc_condition] table.
   - Condition type: The condition collection Type determines the choices:
     - In Scope Definition
       - Primary
       - Supplemental
     - Configuration Definition
       - Not Applicable

To define new condition records:
1. Navigate to IT GRC Administration Conditions.
2. Click New.
3. Populate these fields:
   - Name: Name of the condition collection.
   - Description: Description of the condition collection.
   - Table: Table on which the condition applies.
• Reference Field: For supplemental conditions, the reference field for the table on which the primary condition is running.
• Condition: Condition builder for defining the condition.

Control test processing

When performing a control test, processing dependencies are evaluated.

• If a control test definition is active, the system generates the control test instances dynamically, according to definition. To generate a control test manually:
  1. Navigate to IT GRC Administration Control Test Definitions.
  2. Open a control test definition record.
  3. Click Execute Now.

ServiceNow generates a control test instance, marks it Pending, and assigns it to the group or individual responsible for the test according to the control test definition.

• If sample data was requested in the definition, any sample data that matches the conditions is found in the Supporting Data section. The Test Complete Data Values related list holds references to the records returned by the sample data query.
• If a control test has a condition type of Basic, the value in the Sample size field limits the number of failures that are stored as support data. If the result is passed or compliant, all the matching data is stored.
• If a control test has advanced conditions, the system evaluates them as follows:
  1. The condition collection in the In scope definition reference is processed.
     a. The primary condition is processed on the fields specified in Table and Fields on the control test definition and returns an array of elements.
     b. For each element in the array returned by the primary condition, supplemental conditions are processed, filtering the array of elements further.
     c. The In Scope field is updated with the number of elements in the array.
  2. The condition collection in the Configuration reference is processed on the array of elements returned from the In scope definition. The choices for Configuration to retrieve are:
      • None: These conditions are skipped. Supporting Data includes all the elements that were in scope.
      • Matching: The control test checks the array of elements, returning any elements that match the Configuration.
      • Non-matching: The control test checks the array of elements, returning any elements where at least one condition did not match the Configuration.
  3. The final array of elements is recorded as Supporting Data records.

Remediation Tasks

If the control test reveals problems in the process, create a task from the Remediation Task related list. You can relate remediation tasks to any task in the system with the related items tool from the Many to Many Task Relations plugin.
Scripted audits

A scripted audit enables users with the certification_admin role to conduct an audit from a script rather than using restrictive template conditions.

A scripted audit uses a certification filter to select the records to audit, and then creates standard follow-on tasks for remediation of any discrepancies. Use this type of audit to query for any values or states that a script can define. A scripted audit is a specific audit type that is activated together with the Desired State plugin. ServiceNow provides a sample audit script with configuration instructions.

Create a scripted audit

A scripted audit is an audit whose conditions are defined by a script.

1. Navigate to Compliance Scripted Audits Audits.
   An audit type of Scripted filters the list.
2. Click New.
3. Complete the form (see table).
4. Create the audit script.
   The Run this script field includes a sample script with instructions for performing the audit and generating the follow-on tasks. This field appears only when you access audits from the Scripted Audits module.
5. Click Submit.

Sample script:

```javascript
/*
    /**************************************************************************/
    /// This script works with Data Center Zones filter ///
    /**************************************************************************/

    var desiredFloorSpaceUsage = 30;  // Value to audit against
    var assignToUser = '46d44a23a9fe19810012d100cca80666';  // Beth Anglin
    var assignToGroup = '8a5055c9c61122780043563ef53438e3';  // Hardware group
    var taskMsg = 'See the audit results below for the discrepancies that must be addressed';

    // API call to retrieve records based on the filter
    var gr = new SNC.CertificationProcessing().getFilterRecords(current.filter);

    // Loop over all records defined by the filter
    while(gr.next()) {
        var sysId = gr.getValue('sys_id');  // Sys ID of audited record
        var floorSpaceInUse = gr.getValue('floor_space_in_use');  // Value to audit

        // Determine if certification condition passes or fails
        if (floorSpaceInUse < desiredFloorSpaceUsage) {
            var columnNameSpace = gr.floor_space_in_use.getLabel();  // String value of column audited against

            // Call create Follow on Task API and save the returned sys_id for use in logging audit result fail
            // Params:
            // auditId - Sys id of the audit record executed
            // ciId Sys - id of the configuration item. Empty string if not a cmdb ci
            // assignedTo - Sys id of user to assign task to. Can be empty
            // assignmentGroup - Sys id of group to assign task to. Can be empty
        }
    }
```

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// shortDescr - Short description for the Follow On Task. Can be empty
// Return value: Sys id of the created follow on task
var followOnTask = new
SNC.CertificationProcessing().createFollowOnTask(current.sys_id, sysId,
assignToUser, '', taskMsg);

// Call log failed result API
// Params:
// auditId - Sys id of audit record executed
// auditedRecordId - Sys id of the record audited
// followOnTask - Sys id of the follow on task associated with the
// audited record(@see auditedRecordId). Can be empty
// columnDisplayName - Label of the column audited(ex. Disk space (GB)).
// Can be empty
// operatorLabel - Label of the operator used to audit the column(ex. is
// not empty, greater than). Can be empty
// desiredValue - Desired value of the column. Can be empty
// discrepancyValue - Discrepancy value. Can be empty
// isCI - True, if audited record is a CI. False, otherwise.
// domainToUse - Sys domain of the "cert_audit" record. Can be empty
new SNC.CertificationProcessing().logAuditResultFail(current.sys_id,
sysId, followOnTask, columnNameSpace, 'greater than',
desiredFloorSpaceUsage, floorSpaceInUse, true);
} else { // If certification condition pass, write a Audit Result Pass via
// API
// Params:
// auditId - Sys id of audit record executed
// auditedRecordId - Sys id of the record audited
// isCI - True, if audited record is a CI. False, otherwise. Can be empty.
// domainToUse - Sys domain of the "cert_audit" record. Can be empty.
new SNC.CertificationProcessing().logAuditResultPass(current.sys_id,
sysId, true);
}
*/
Figure 63: Scripted audit

Table 57: New scripted audit table.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name for this audit.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Filter</td>
<td>Filter to use when the audit type is Scripted. This field is required for scripted audits, but is hidden for all other audit types.</td>
</tr>
<tr>
<td>Template</td>
<td>[Required] Template to use when this audit runs. Audit type filters the list of available templates and only the active versions of a template are available for selection. This field is hidden when the audit type is Scripted.</td>
</tr>
<tr>
<td>Table</td>
<td>[Read-only] Displays the table for the template.</td>
</tr>
<tr>
<td>Create tasks</td>
<td>Creates follow-on tasks for correcting discrepancies when selected. In a scripted audit, you can create the logic for either task state by using true to create a task or false if no task is created. By default, this check box is cleared (false) in a new audit record.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Assignment type</td>
<td>A choice list to select how the audit assigns the follow-on tasks. This field is visible only when the Create task check box is selected. Choices are:</td>
</tr>
</tbody>
</table>

**Table 58: Choice list**

<table>
<thead>
<tr>
<th>Choice</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Field</td>
<td>Select a user reference field on the table being audited. As an example, select the user named in the Managed by field on the failed record to perform the tasks. This selection displays the Assigned to and Assign to empty fields. If the reference field on the record is empty, the value in the Assign to empty field is used.</td>
</tr>
<tr>
<td>Specific User</td>
<td>Select a specific user to perform the tasks. This selection displays the User field.</td>
</tr>
<tr>
<td>Group Field</td>
<td>Select a group reference field on the table being audited. As an example, select the Support group from the failed record to perform the tasks. This selection displays the Assign to group and Assign to empty fields. All members of the group from the reference field on the failed record are assigned to the tasks. If the reference field on the record is empty, the value in the Assign to empty field is used.</td>
</tr>
<tr>
<td>Specific Group</td>
<td>Select a specific group to perform the tasks. All members of the selected group are assigned to the tasks.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| User          | The specific user this audit assigns to follow-on tasks. This field is available under these conditions:  
• Assignment type is set to Specific User.  
• Assign to empty is set to Create Assigned Task, and Assignment type is set to User Field.  

**Note:** Ensure that the specified user has the *certification role*. |
<p>| Assign to group | The group field that defines which group this audit assigns to the follow-on task. This field is available only when the Assignment type is Group Field.                                                                                                                                   |
| Group         | The specific group this audit assigns to follow-on tasks. This field is available only when the Assignment type is Specific Group and you have selected Group Field as the assignment type.                                                                                                        |
| Assign to     | The user field that defines which user this audit assigns to the follow-on task. This field is available only when the Assignment type is User Field.                                                                                                                                                  |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assign to empty</td>
<td>The behavior to use if the field selected in Assign to or Assign to group is blank on the record being audited. For example, if a follow-on task must be assigned to a manager, but no manager is identified, the value in this field determines what happens. This field appears only when the Assignment type is User Field or Group Field. The possible selections are:</td>
</tr>
<tr>
<td></td>
<td><strong>Table 59: Field selection</strong></td>
</tr>
<tr>
<td><strong>Selection</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>Do Not Create Task</td>
<td>No follow-on task is created when the Assign to or Assign to group field is empty.</td>
</tr>
<tr>
<td>Create Unassigned Task</td>
<td>Create a follow-on task, but do not assign it to any user or group. The task can be manually assigned later.</td>
</tr>
<tr>
<td>Create Assigned Task</td>
<td>Create a follow-on task and assign it to the user or group specified. If you selected an assignment type of User Field, the User field becomes available. If you selected the Group Field type, the Group field becomes available.</td>
</tr>
<tr>
<td></td>
<td>The audit automatically creates follow-on tasks for all records that have Assign to populated, regardless of which selection you make for Assign to empty.</td>
</tr>
<tr>
<td>Short description</td>
<td>Brief description of the purpose of the audit.</td>
</tr>
<tr>
<td>Task description</td>
<td>General description of the work required for the follow-on tasks created by this audit. All follow-on tasks created by this audit inherit this description.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Active</td>
<td>Activates this audit schedule and generates follow-on tasks at the scheduled date and time. Clear this check box to hide scheduling fields on the form (except Last run date) and not generate follow-on tasks.</td>
</tr>
<tr>
<td>Run</td>
<td>How often to run the schedule that generates the audit.</td>
</tr>
<tr>
<td></td>
<td>• Daily</td>
</tr>
<tr>
<td></td>
<td>• Weekly</td>
</tr>
<tr>
<td></td>
<td>• Monthly</td>
</tr>
<tr>
<td></td>
<td>• Periodically</td>
</tr>
<tr>
<td></td>
<td>• Once</td>
</tr>
<tr>
<td></td>
<td>• On demand</td>
</tr>
<tr>
<td>Day</td>
<td>• If Run is Weekly, the day of the week when the audit runs.</td>
</tr>
<tr>
<td></td>
<td>• If Run is Monthly, the day of the month when the audit runs. If the day is 29, 30 or 31, for shorter months the audit runs on the last day of the month.</td>
</tr>
<tr>
<td>Repeat Interval</td>
<td>If Run is Periodically, the frequency that the audit runs entered in time, days, or both.</td>
</tr>
<tr>
<td></td>
<td>For example, set Days to 10 and Hours to 14:00:00 to run the audit every 10 days at 2:00pm.</td>
</tr>
<tr>
<td>Starting</td>
<td>If Run is Periodically or Once, the date and time when the audit runs.</td>
</tr>
<tr>
<td>Time</td>
<td>If Run is Daily, Weekly, Monthly, or Once, the time of day, on a 24-hour clock, when the audit runs.</td>
</tr>
<tr>
<td>Last run date</td>
<td>[Read-only] The last date and time the audit ran, either on its regular schedule or manually. Audit previews do not update this field.</td>
</tr>
<tr>
<td>Next scheduled run</td>
<td>[Read-only] The next date and time on which the audit runs. The system recalculates this field when you change the schedule.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Audit type    | [Read-only] The type assigned to this audit. The system selects the audit type based on the application from which the audit was created and can be:  
• Desired State  
• Architecture Compliance  
• Compliance  
• Scripted  

Run this script | Audit script to run. This field is available only when the audit type is Scripted. The Audit form includes a sample script with instructions for performing the audit and generating the follow-on tasks. See Script Methods for a list of the methods provided and the accepted parameters.  

---

### Script methods

ServiceNow provides four methods for creating the audit script.

**Table 60: Script methods**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Parameters</th>
</tr>
</thead>
</table>
| getFilterRecords      | public GlideRecord  
getFilterRecords(String filterId) | filterId: The sys_id of the filter to use.                                                    |
| logAuditResultPass    | public void  
logAuditResultPass(String auditId, String auditedRecordId, boolean isCI, String domainToUse) | auditId: Sys_id of audit record executed  
auditedRecordId: Sys_id of the record audited.  
isCI: True, if the audited record is a CI, false if otherwise.  
domainToUse: Sys_domain of the cert_audit record. |
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Parameters</th>
</tr>
</thead>
</table>
| logAuditResultFail  | public void logAuditResultFail(String auditId, String auditedRecordId, String followOnTask, String columnDisplayName, String operatorLabel, String desiredValue, String discrepancyValue, boolean isCI, String domainToUse) | auditId: Sys_id of audit record executed.  
           auditedRecordId: Sys_id of the record audited.  
           followOnTask: Sys_id of the follow-on task associated with the audited record and can be an empty string.  
           columnDisplayName: Label of the column audited. For example, Disk space (GB).  
           operatorLabel: Label of the operator used to audit the column. For example, is not empty or greater than can be the label.  
           desiredValue: Desired value of the column.  
           discrepancyValue: Discrepancy value.  
           isCI: True, if the audited record is a CI, false if otherwise.  
           domainToUse: Sys_domain of the cert_audit record. |
| createFollowOnTask()| public String createFollowOnTask(String auditId, String cild, String assignedTo, String assignmentGroup, String shortDescr) | auditId: Sys_id of the audit record executed.  
           cild: Sys_id of the configuration item. This string is empty when the table is not extended from the cmdb_ci table.  
           assignedTo: Sys_id of the assigned user of the task. This string can be empty.  
           assignmentGroup: Sys_id of the group the task is assigned to. This string can be empty.  
           shortDescr: The text to use for the short description of the follow-on task. |

**Data Certification**

Data Certification manages scheduled and on-demand validations of the configuration management database (CMDB) data.
Information is added to the CMDB by Discovery, by importing from third-party tools, or manually. For regulatory or procedural reasons, information in the CMDB requires checks for accuracy and certification. The person or team responsible for certification can define what information requires verification and a verification schedule. The schedule then generates a checklist for verifying the data. Individuals assigned to certification tasks answer a series of questions to verify the data.

Data certification can be performed against specific fields on specific tables. Based on the certification schedule, certification tasks are automatically created and assigned. For example, you can set up a certification to validate key information fields, such as Operating System and CPU count, on all Windows servers located in Chicago. You can then assign the tasks to the appropriate team member automatically.

Domain separated systems can use the Data Certification application.

Activate Data Certification

Activate the Data Certification plugin to access the application. Activating this plugin also activates the Version Management plugin, which manages certification filter versions.

Role required: admin

For evaluation, you can activate the plugin for an application that requires a purchased subscription on a non-production instance. To activate the plugin on production instances, you must purchase the subscription. To purchase a subscription, contact your ServiceNow account manager. For details on purchasing a plugin, see Purchase a plugin.

Some plugins require activation by ServiceNow personnel. Request these plugins through the HI Customer Service System instead of activating them yourself. For details, see Request a plugin.

For plugins that you can activate yourself, continue with the following steps.

1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.
   - If the plugin depends on other plugins, these plugins are listed along with their activation status.
   - If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).
4. If available, select the Load demo data check box.
   - Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.
   - You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.
5. Click Activate.

Installed With Data Certification

Activating the Data Certification plugin installs the following components.

Demo data is available with Data Certification. The demo data provides information including filters, schedules, instances, and tasks.
Tables

Data Certification adds the following tables:

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certification Audit Definition [cert_audit_definition]</td>
<td>Stores collections of certification schedules that can be run as a single entity.</td>
</tr>
<tr>
<td>Certification Audit Definition Elements [m2m_cert_audit_def_cert_sched]</td>
<td>Lists the certification schedules in each certification audit definition.</td>
</tr>
<tr>
<td>Certification Audit Instance [cert_audit_instance]</td>
<td>Stores the certification instances associated with a specific audit definition.</td>
</tr>
<tr>
<td>Certification Element [cert_element]</td>
<td>Stores the data elements that are grouped into certification tasks.</td>
</tr>
<tr>
<td>Certification Filter [cert_filter]</td>
<td>Stores the data that requires certification using a filtering condition for the certification.</td>
</tr>
<tr>
<td>Certification Instance [cert_instance]</td>
<td>Stores a collection of certification tasks representing a single instance of a scheduled certification. This table extends the Audit [cert_audit] table.</td>
</tr>
<tr>
<td>Certification Schedule [cert_schedule]</td>
<td>Stores certification for a specific set of information on a specific table, what user or group the tasks are assigned to, and how often this certification is done.</td>
</tr>
</tbody>
</table>

Script Includes

Data Certification adds the following script includes:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CertificationAjax</td>
<td>Provides utilities that enable individual certification elements to be certified, rejected, or reverted.</td>
</tr>
<tr>
<td>CertificationTaskCreate</td>
<td>Custom code that extends the standard code for certification tasks.</td>
</tr>
<tr>
<td>CertTaskEscalationTimerPercentage</td>
<td>Updates time and percentage complete information for a certification.</td>
</tr>
<tr>
<td>CertificationUtilities</td>
<td>Provides utility functions for certification.</td>
</tr>
</tbody>
</table>

Client Scripts

Data Certification adds the following client scripts:
<table>
<thead>
<tr>
<th>Name</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alert If Boxes Checked</td>
<td>Certification Task [cert_task]</td>
<td>Provides a warning if the certifier attempts to leave a record without certifying the checked elements.</td>
</tr>
<tr>
<td>Check Table Name</td>
<td>Certification Schedule [cert_schedule]</td>
<td>Updates the table name when a different filter is selected.</td>
</tr>
</tbody>
</table>

**UI Policies**

Data Certification adds the following UI policies:

<table>
<thead>
<tr>
<th>Name</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hide next scheduled run</td>
<td>Certification Schedule [cert_schedule]</td>
<td>Hides the Next Scheduled Run field when the schedule is set to run once or on demand only.</td>
</tr>
<tr>
<td>• Hide &quot;run&quot; associated fields when active is set to false</td>
<td>Certification Schedule [cert_schedule]</td>
<td>Hides the Run field when Active is set to False.</td>
</tr>
<tr>
<td>• Hide Run When Not Active</td>
<td>Certification Schedule [cert_schedule]</td>
<td></td>
</tr>
<tr>
<td>Make table name read only</td>
<td>Certification Schedule [cert_schedule]</td>
<td>Makes the Table field read-only.</td>
</tr>
<tr>
<td>Hide Table field</td>
<td>Certification Element [cert_element]</td>
<td>Hides the Table field on the certification task form.</td>
</tr>
<tr>
<td>Make percent complete field read only</td>
<td>Certification Instance [cert_instance]</td>
<td>Makes the Percent complete field read only when the State is Work in Progress, Closed Complete, Closed Incomplete, or Cancelled.</td>
</tr>
<tr>
<td>Show Assign to fields</td>
<td>Certification Schedule [cert_schedule]</td>
<td>Shows the Assign To field when the assignment type is User and hides the Assign To field for all other assignment types.</td>
</tr>
<tr>
<td>Show Group field</td>
<td>Certification Schedule [cert_schedule]</td>
<td>Shows the Assignment Group field when the assignment type is Group and hides the Assignment Group field for all other assignment types.</td>
</tr>
<tr>
<td>Show User field</td>
<td>Certification Schedule [cert_schedule]</td>
<td>Shows the User field when the assignment type is User.</td>
</tr>
<tr>
<td>Show Assignment Fields</td>
<td>Certification Schedule [cert_schedule]</td>
<td>Shows the Assign To Empty option when the assignment type is User Field or Group Field.</td>
</tr>
</tbody>
</table>
### Business Rules

Data Certification adds the following business rules:

<table>
<thead>
<tr>
<th>Name</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjust dates for cert tasks</td>
<td>Certification Instance [cert_instance]</td>
<td>Adjusts dates for tasks belonging to the certification instance when the dates are changed for an active certification.</td>
</tr>
<tr>
<td>Cancel Instance</td>
<td>Certification Instance [cert_instance]</td>
<td>Cancels all open certification tasks when an active certification is canceled.</td>
</tr>
<tr>
<td>certification audit instance events</td>
<td>Certification Audit Instance [cert_audit_instance]</td>
<td>Sends an inserted event when an active certification audit instance is created. Sends a completed event when an active certification audit instance is marked as complete or incomplete.</td>
</tr>
<tr>
<td>certification element events</td>
<td>Certification Element [cert_element]</td>
<td>Sends a failed event when an element of a certification is marked as failed.</td>
</tr>
<tr>
<td>certification instance events</td>
<td>Certification Instance [cert_instance]</td>
<td>Sends an inserted event when an instance of a certification is created. Sends a completed event when an instance of a certification is completed.</td>
</tr>
<tr>
<td>Certification Instance Rollup</td>
<td>Certification Task [cert_task]</td>
<td>Updates the Percent complete field on the certification instance record.</td>
</tr>
<tr>
<td>certification task events</td>
<td>Certification Task [cert_task]</td>
<td>Sends an inserted event when a task is inserted. Sends a completed event when a task is deactivated. Sends a canceled event when a task is canceled.</td>
</tr>
<tr>
<td>Certification Task Values</td>
<td>Certification Element [cert_element]</td>
<td>Updates the percent complete of the parent task when a certification element is updated.</td>
</tr>
<tr>
<td>Check Certification Audit Progress</td>
<td>Certification Instance [cert_instance]</td>
<td>Updates the completion status of the audit instance as a whole when a certification that is part of an audit is complete.</td>
</tr>
<tr>
<td>Clean Certification Views</td>
<td>Certification Instance [cert_instance]</td>
<td>Cleans all related records when a certification instance is deleted.</td>
</tr>
<tr>
<td>Copy certification schedule fields</td>
<td>Certification Instance [cert_instance]</td>
<td>Copies changes to the certification schedule to the certification instance.</td>
</tr>
<tr>
<td>Name</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>----------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Merge Certification Tasks</td>
<td>Certification Task [cert_task]</td>
<td>Merges two tasks together when a task is reassigned and there is another task for the same instance with the new user.</td>
</tr>
<tr>
<td>Prevent delete of Filter with Schedule</td>
<td>Certification Filter [cert_filter]</td>
<td>Prevents the deletion of a filter that is used in a schedule.</td>
</tr>
<tr>
<td>Reassign Notification</td>
<td>Certification Task [cert_task]</td>
<td>Sends out a notification to the new and previous assignees when a task is reassigned.</td>
</tr>
<tr>
<td>Rollup State</td>
<td>Certification Task [cert_task]</td>
<td>Updates all necessary parent items when task state is changed.</td>
</tr>
<tr>
<td>Update audit reference</td>
<td>Certification Task [cert_task]</td>
<td>Makes Data Certification records compatible with Desired State records. This rule makes sure that the Audit field is correctly completed when a record is inserted using Insert and Stay.</td>
</tr>
<tr>
<td>Update audit result</td>
<td>Certification Element [cert_element]</td>
<td>Makes Data Certification records compatible with Desired State records for reporting purposes. This rule puts certified values in the Desired value column when an audit is Certified. It also puts actual values in the Discrepancy value column when an audit is Failed.</td>
</tr>
<tr>
<td>Update follow_on_task &amp; audit references</td>
<td>Certification Element [cert_element]</td>
<td>Makes Data Certification records compatible with Desired State records for reporting purposes. This rule makes certification tasks compatible with follow-on tasks and displays all tasks, regardless of origin.</td>
</tr>
<tr>
<td>Update next run time</td>
<td>Certification Schedule [cert_schedule]</td>
<td>Updates the Next scheduled run field when a schedule runs Daily, Weekly, Monthly, or Periodically.</td>
</tr>
<tr>
<td>Verify Fields</td>
<td>Certification Schedule [cert_schedule]</td>
<td>Verifies that no field is used in both Display and Certification fields when the fields of a certification schedule are changed.</td>
</tr>
</tbody>
</table>
Formatter

Data Certification adds the following formatter:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certification Task Elements</td>
<td>Enables custom user interface formatting of elements on a certification task. For example, displays the green check mark and red exclamation point to use when certifying an element.</td>
</tr>
</tbody>
</table>

Properties

<table>
<thead>
<tr>
<th>Name</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.ui.cert_task_activity.fields</td>
<td>System Properties [sys_properties]</td>
<td>Defines which journal field is the task activity field. Default: work_notes</td>
</tr>
</tbody>
</table>

User Roles

Data Certification adds the following user roles:

<table>
<thead>
<tr>
<th>Role</th>
<th>Contains Roles</th>
<th>Description</th>
</tr>
</thead>
</table>
| certification_admin | certification | Can:  
• Create and configure certifications  
• Override provided answers  
• Perform certification tasks for certification task owners  
• Send certification task notifications to users and owners at any time  
• Cancel or delete certifications in any state |
<p>| certification_filter_admin | certification | Can create and manage all data certification filters. |</p>
<table>
<thead>
<tr>
<th>Role</th>
<th>Contains Roles</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>certification</td>
<td>none</td>
<td>Can update active or incomplete tasks assigned to them or to groups of which they are a member. Can also update configuration items owned by them or by groups of which they are a member. Receives email notifications when assigned certification tasks.</td>
</tr>
</tbody>
</table>

**Events**

Data Certification adds the following events. The ServiceNow system uses these events to send email notifications to task owners and managers about changes in certification records.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>cert_audit_instance.completed</td>
<td>A certification audit instance has been completed.</td>
</tr>
<tr>
<td>cert_audit_instance.inserted</td>
<td>A certification audit instance has been inserted.</td>
</tr>
<tr>
<td>cert_element.failed</td>
<td>A certification element has failed certification.</td>
</tr>
<tr>
<td>cert_instance.complete</td>
<td>A certification instance has been completed.</td>
</tr>
<tr>
<td>cert_instance.inserted</td>
<td>A certification instance has been inserted.</td>
</tr>
<tr>
<td>cert_task.cancelled</td>
<td>A certification task has been canceled.</td>
</tr>
<tr>
<td>cert_task.completed</td>
<td>A certification task has been completed.</td>
</tr>
<tr>
<td>cert_task.escalate</td>
<td>A certification task record has been escalated.</td>
</tr>
<tr>
<td>cert_task.inserted</td>
<td>A new certification task has been created.</td>
</tr>
<tr>
<td>cert_task.notifications</td>
<td>A certification task notification has been resent to a user.</td>
</tr>
<tr>
<td>cert_task.overdue</td>
<td>A certification task is past its specified completion date.</td>
</tr>
<tr>
<td>cert_task.reassign</td>
<td>A certification task has been reassigned.</td>
</tr>
<tr>
<td>cert_task.warning</td>
<td>A new task escalation point has been reached.</td>
</tr>
</tbody>
</table>

**Email Templates**

Data Certification adds the following email templates:

<table>
<thead>
<tr>
<th>Name</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>certification.task.cancelled</td>
<td>A certification task assigned to you/your group as part of the data certification and management process has been canceled.</td>
</tr>
<tr>
<td>Name</td>
<td>Message</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>certification.task.reminder.inserted</td>
<td>A certification task that has been assigned to you/your group as part of the data certification and management process requires attention.</td>
</tr>
<tr>
<td>certification.task.reminder.outstanding</td>
<td>A certification task that has been assigned to you/your group as part of the data certification and management process requires attention.</td>
</tr>
<tr>
<td>certification.task.reminder.overdue</td>
<td>A certification task that has been assigned to you/your group as part of the data certification and management process is overdue.</td>
</tr>
</tbody>
</table>

Certification schedules

A certification schedule defines the information that requires certification and the frequency of execution. At each time interval specified, or on-demand, the certification schedule generates a set of certification tasks based on set conditions. Use the Preview Certification Tasks related link to preview the certification tasks generated from a certification schedule.
Figure 64: Certification schedule

The minimum requirements for Unix Servers are:
- CPU Speed: 3ghz
- Ram: 16gb
- CPU Core Count: 4
Certification tasks

A certification task represents the work of verifying the data associated with a particular record. Task owners are responsible for performing the certification tasks. Tasks have an associated workflow that sends reminders to the task owner and, if necessary, the manager of the owner at regular intervals.
Figure 65: Certification task
Certification elements

Each element of each record being certified is tracked in its own certification element record. Also tracked are the date and time when the element was certified, comments, and the original and certified values of the field. You can view elements on individual certification tasks.

Figure 66: Certification elements
Certification instances

A certification instance is the collection of certification tasks for one execution of a certification schedule.

Certification audit instances

A certification audit instance is a collection of the certification instances and tasks generated by a single execution of the certification audit definition.
Figure 68: Certification audit instance

Certification audit definition

A certification audit definition is a collection of certification schedules that can be run at once.
Figure 69: Certification audit definition
Data Certification Overview module

The Data Certification Overview module displays various data certification-related reports on the Data Certification Console homepage.

The Overview module is a type of homepage.

The different levels of access are:

<table>
<thead>
<tr>
<th>Role</th>
<th>Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>certification</td>
<td>View (view overview page and refresh reports)</td>
</tr>
<tr>
<td>certification_admin</td>
<td>• View (view overview page and refresh reports)</td>
</tr>
<tr>
<td></td>
<td>• Customize (refresh, add, delete, and rearrange reports)</td>
</tr>
<tr>
<td>admin</td>
<td>• View (view overview page and refresh reports)</td>
</tr>
<tr>
<td></td>
<td>• Customize (refresh, add, delete, and rearrange reports)</td>
</tr>
<tr>
<td></td>
<td>• Edit (can edit reports)</td>
</tr>
</tbody>
</table>

Data Certification Overview Module

The Overview module includes the following reports:

<table>
<thead>
<tr>
<th>report</th>
<th>Description</th>
<th>Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>30/60/90 Day Aging</td>
<td>Groups tasks by the number of days (30, 60, 90, and 90 and over) since the task was opened.</td>
<td>Certification Task</td>
</tr>
<tr>
<td>Certification Instances</td>
<td>Lists all certification instances.</td>
<td>Certification Instance</td>
</tr>
<tr>
<td>Certification Progress Report</td>
<td>Groups tasks by task owner, indicating task progress as a percentage.</td>
<td>Certification Task</td>
</tr>
<tr>
<td>Certification Task Completed Report</td>
<td>Groups tasks by task owner, indicating tasks that are complete.</td>
<td>Certification Task</td>
</tr>
<tr>
<td>Exceptions To Date</td>
<td>Lists all task elements that have comments added and a state of Failed or In Progress.</td>
<td>Certification Element</td>
</tr>
<tr>
<td>report</td>
<td>Description</td>
<td>Table</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------------------------------</td>
</tr>
<tr>
<td>Functional Roll Up</td>
<td>Lists the managers that have groups with assigned certification tasks. The report is a horizontal bar chart, grouped by status, with each bar representing a manager of an assignment group.</td>
<td>Certification Task</td>
</tr>
<tr>
<td>Hierarchical Roll Up</td>
<td>Shows the managers that have employees with assigned certification tasks (task owners). The report is a horizontal bar chart, grouped by status, with each bar representing a manager of a task owner (identified in the Assigned to field).</td>
<td>Certification Task</td>
</tr>
<tr>
<td>Upcoming Schedules</td>
<td>Lists all schedules that are scheduled to run within the next 30 days.</td>
<td>Certification Schedule</td>
</tr>
</tbody>
</table>

**Use the Data Certification Overview module**

View the status of data certification tasks.

1. Navigate to Data Certification Overview.
2. Click elements within the reports to obtain more information.
   - For example, click any of the colored bars in the Functional Roll Up bar chart and detailed information replaces the Data Certification Console screen.
3. Update some fields directly on the overview page.
   - For example, in the red box on the image shown, a certification schedule is being updated in the certification instances report.
Figure 70: Data certification overview module
Data Certification planning

Initial planning can make the certification process more successful.

By defining certification schedules and certification audit definitions, users with the certification_admin role establish when certifications are performed, who performs it, and what data must be certified.

Required Roles

Users with the certification_admin role can view filter versions. These users can create, update, and delete filters, if they have the proper access to necessary tables. In the base ServiceNow system, certification_admin users have limited system rights and do not have access to all the tables required for creating a filter. When assigning compliance resources, make sure to grant additional roles to the certification_admin user as needed. For example, this user requires roles that grant access to these tables:

- Company [core_company]
- Cost Center [cmn_cost_center]
- Schedule [cmn_schedule]

Planning Data Certification

Planning the data certification process requires defining:

- The certification schedule defines certification for a particular set of information on a particular table. It also generates certification tasks to perform that certification. One certification task is generated per task owner and a certification instance record groups the tasks.
- The optional certification audit definition groups some certification schedules to be performed together and generates certification audit instances to perform them.

The following questions require answers for each certification schedule:

- What information requires certification?
- When is the due date for certification?
- Who must perform the certification?

Create a certification filter

A filter is a subset of configuration items from any ServiceNow table that is created with a standard condition builder.

An example is a filter that selects all UNIX servers in the Australian data center.

With filters, you can:

- Create multiple versions of a filter and then select the version you want to use.
- Use one filter on multiple certification schedules.
- View the number of records that match your filter as you create the conditions.

Note: Be sure to create certification filters before creating certification schedules.

1. Navigate to Data Certification Certification Filters.
2. Click New.
3. Fill in the form (see table).
4. Click Submit.

This action saves the filter as version 1.

![Certification Filter V1](image)

**Figure 71: Certification filter V1**

5. To create another filter version, modify the filter conditions and click Update.

The system saves the new filter and increments the version number.
Figure 72: Certification filter V2

By default, the Certification Filters list shows only the current version of each filter. To see all filter versions, click All in the breadcrumbs.
6. To make an inactive filter the current version, open the inactive filter and click Revert.
Figure 74: Certification filter revert

This action creates a new, active version of the filter and makes all previous versions inactive.

7. To delete a single filter version, open that version record and click Delete.
8. To delete inactive versions of a filter, click Delete inactive versions under Related Links in that filter record.

You cannot delete a filter that is used in a schedule definition. The system displays a warning and the filter is not deleted.

Table 66: Creating certification filters

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>[Required] Filter name.</td>
</tr>
<tr>
<td>Description</td>
<td>[Optional] Brief description of the filter.</td>
</tr>
<tr>
<td>Number</td>
<td>[Read-only] Automatically assigned filter identification number.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Table</td>
<td>Table containing the records to be filtered. Use of the Database View [sys_db_view] table is limited by version.</td>
</tr>
<tr>
<td>Active</td>
<td>Control to make the filter available for use from the Filter field on the Certification Schedule form.</td>
</tr>
<tr>
<td>Version</td>
<td>Current version of this filter. Any significant changes to the filter make the current version inactive. The system copies the updated filter, marks it as active, and increments the version number. The system saves all versions of the filter and makes them available to users. More than one version of a filter can be marked active.</td>
</tr>
<tr>
<td>Filter condition</td>
<td>Field, operator, and value to create the condition. The available options depend on the table selected. You can view the number of records that match the filter by clicking the refresh icon.</td>
</tr>
</tbody>
</table>

Figure 75: Refresh Conditions

If the filter does not match any records, the system marks the certification instance as Closed Complete, with the Percent complete value set to 100%.

Define a certification schedule

A certification schedule specifies the fields to display, the fields that require certification, certification task assignments, completion requirements for task owners, frequency of schedule, and detailed instructions.

Use the preview option to see what tasks are created before saving the schedule. If the tasks are not what you want, edit the schedule and preview the tasks again. The system creates certification tasks automatically when it executes a schedule.

To schedule a certification:

1. Navigate to Data Certification Schedule Definitions.
2. Click New.
3. Fill in the fields (see table).
4. Click Submit.
### Table 67: Defining A Certification Schedule

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>A schedule name.</td>
</tr>
<tr>
<td>Filter</td>
<td>A certification filter for this schedule.</td>
</tr>
<tr>
<td>Table</td>
<td>[Read-only] The table holding the records to be certified. To change the table name, select a different Filter or create a new Filter.</td>
</tr>
<tr>
<td>Display fields</td>
<td>The fields displayed in the Certification Task list to provide context. These do not require certification themselves. For example, although users are not required to certify the Name field of a record, it displays so that users know what record they are certifying.</td>
</tr>
<tr>
<td>Certification fields</td>
<td>The fields to certify on this certification schedule.</td>
</tr>
<tr>
<td>Assignment type</td>
<td>A choice list to select how the certification schedule assigns the certification tasks.</td>
</tr>
<tr>
<td></td>
<td>• User Field: Select a user reference field on the table being certified. As an example, select the user named in the Managed by field to identify the user who performs the task. This selection displays the Assign to and Assign to empty fields. If the reference field on the record is empty, the value in the Assign to empty field is used.</td>
</tr>
<tr>
<td></td>
<td>• Specific User: Select a specific user to perform the tasks. This selection displays the User field.</td>
</tr>
<tr>
<td></td>
<td>• Group Field: Select a group reference field on the table being certified. As an example, select the Support group field to identify the user who performs the task. This selection displays the Assign to group and Assign to empty fields. All members of the group from the reference field on the record are assigned to the tasks. If the reference field on the record is empty, the value in the Assign to empty field is used.</td>
</tr>
<tr>
<td></td>
<td>• Specific Group: Select a specific group to perform the tasks. This selection displays the Group field. All members of the named group are assigned to the tasks.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| User        | This field appears when:  
  • Assignment type is Specific User. This system assigns this user to all certification tasks for this schedule.  
  • The Assign to empty field is set to Create Assigned Task, and you have selected User Field as the assignment type. The system assigns this user to certification tasks containing unassigned records.  
  You can only select users with the certification role. |
<p>| Assign to group | The group field that defines the group assigned to the certification tasks. This field is available only when the Assignment type is Group Field. |
| Group       | The specific group to which certification tasks are assigned for this schedule. This field is available only when the Assignment type is Specific Group |
| Assign to   | The user field that defines which user is assigned to the certification task. This field is available only when the Assignment type is User Field. |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
</table>
| Assign to empty     | The behavior to use if the field selected in Assign to or Assign to group is blank on the record being certified. For example, if a task must be assigned to a manager, but no manager is identified, the value in this field determines what happens. This field appears only when the Assignment type is User Field or Group Field. The possible selections are:  
  - Do Not Create Task: No task is created when the Assign to or Assign to group field is empty.  
  - Create Unassigned Task: Create a task, but do not assign it to any user or group. The task can be manually assigned later.  
  - Create Assigned Task: Create a task and assign it to the user or group specified. If you selected an assignment type of User Field, the User field is available. If you selected the Group Field type, the Group field is available.  

The schedule automatically creates certification tasks for all records that do have "Assign to" populated, regardless of which selection you make for "Assign to empty." |
| Days to complete    | [Required] The number of days that task owners have to complete the certification tasks. When the certification schedule is part of a certification audit definition, the Days to Complete audit definition value overrides the value set for the certification schedule. |
| Active              | Check box to activate this certification schedule, generating certification tasks at the scheduled date and time. Clear this check box to hide scheduling fields on the form (except Last run date) and not generate certification tasks. |
| Run                 | How often to run the schedule that generates certification tasks:  
  - Daily  
  - Weekly  
  - Monthly  
  - Periodically  
  - Once  
  - On Demand |
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day</td>
<td>When Run is Weekly, the day of the week when the schedule runs and generates certification tasks. When Run is Monthly, the day of the month the schedule runs and generates certification tasks. If the day is 29, 30 or 31, the certification runs on the last day of the month for shorter months.</td>
</tr>
<tr>
<td>Repeat Interval</td>
<td>When Run is Periodically, the frequency that the schedule runs to generate certification tasks, entered in time, days, or both. For example, set Days to 10 and Hours to 14:00:00 to run the schedule and generate certification tasks every 10 days at 14:00.</td>
</tr>
<tr>
<td>Starting</td>
<td>When Run is Periodically or Once, the date and time the schedule runs and generates certification tasks.</td>
</tr>
<tr>
<td>Time</td>
<td>When Run is Daily, Weekly, Monthly, or Once, the time of day, on a 24-hour clock, the schedule runs and generates certification tasks.</td>
</tr>
<tr>
<td>Last run date</td>
<td>[Read-only] The date and time that the schedule ran last, either on its regular schedule or manually, and generated certification tasks.</td>
</tr>
<tr>
<td>Next scheduled run</td>
<td>[Read-only] The next date and time the schedule runs and generates certification tasks.</td>
</tr>
<tr>
<td>Task Description</td>
<td>A description to add to the Short Description field of the certification task.</td>
</tr>
<tr>
<td>Instructions</td>
<td>An HTML field for providing instructions to the user or group performing the certification.</td>
</tr>
</tbody>
</table>

**Preview a certification task**

Previewing certification tasks saves any changes to the Certification Schedule form and displays the tasks that are created when you execute the certification schedule.

Previewing tasks is especially useful if you want to test different combinations of options in the Assignment type, Assign to, and Assign to empty fields.

1. Navigate to Data Certification Schedules Schedule Definitions.
2. Click a certification schedule Name.
3. In Related Links, click Preview Certification Tasks.
   - The tasks to be created appear at the top of the screen.
Use a certification schedule notification

After you define a certification schedule, the system automatically sends notifications to specific users based on the information in the schedule.

The following notifications are sent automatically:

<table>
<thead>
<tr>
<th>Time elapsed to end date</th>
<th>Email template name</th>
<th>Notification message is sent to</th>
</tr>
</thead>
<tbody>
<tr>
<td>0% (when task is created)</td>
<td>certification.task.reminder.inserted</td>
<td>task owner or assignment group, if specified</td>
</tr>
<tr>
<td>50%</td>
<td>certification.task.reminder.outstanding</td>
<td>task owner or assignment group, if specified</td>
</tr>
<tr>
<td>75%</td>
<td>certification.task.reminder.outstanding</td>
<td>task owner, assignment group, if specified, and manager of the task owner, if specified</td>
</tr>
<tr>
<td>95%</td>
<td>certification.task.reminder.outstanding</td>
<td>task owner, assignment group, if specified, and manager of the task owner, if specified</td>
</tr>
<tr>
<td>100%</td>
<td>certification.task.reminder.overdue</td>
<td>task owner, assignment group, if specified, and manager of the task owner, if specified</td>
</tr>
</tbody>
</table>

The email templates used in the notifications can be edited, for example, to change the email message text.

Executing a Certification Schedule

Executing a certification schedule generates certification tasks based on the schedule.

1. Navigate to Data Certification Schedules Schedule Definitions.
2. Click a certification schedule Name.
3. Click Execute Now.

The related lists Certification Instances and Certification Tasks display the instances or tasks generated by the schedule. The amount of time it takes to generate all certification tasks depends on the size of the table selected and how many fields require certification.
Define and create a certification audit

A certification audit is a collection of certification schedules that can be run as a single entity.

Certification audits can be useful when there are multiple certification schedules. After creating a certification audit definition, you can generate a certification audit instance. The certification audit instance is a collection of the certification instances and tasks generated by a single execution of the certification audit definition.

1. Navigate to Data Certification Audits Audit Definitions.
2. Click New.
3. Fill in the fields (see table).
4. Right-click the header bar and select Save.
5. In the Certification Schedules related list, click Edit.
6. In the Collection list on the left, select one or more schedules and click Add.
7. Click Save.
8. In Related Links, click Create Certification Audit Instance.

   The system generates an audit instance based on the certification schedules selected. All audit instances based on this audit definition are listed in the Certification Audit Instances related list.
Track a certification audit instance

You can view a list of all certification audit instances at any time.

1. Navigate to Data Certification Audits Audit Instances.
2. View the Certification Instances related list.
   The list contains each of the associated instances generated as part of the audit.

Data certification performance

After the certification process has been planned, certification tasks can be performed according to defined schedules.

Users with the certification role can perform certification tasks. The certification tasks can be tracked as part of certification instances.

Fulfill certification tasks

After you execute a certification schedule manually or at a scheduled time, the ServiceNow system performs certain actions.

After you execute a certification schedule manually or at a scheduled time, ServiceNow performs the following actions:

- Creates tasks for any records that meet the filter requirements in the specified table, like tasks from the Configuration Item [cmdb_ci] table.
- Assigns the new tasks to the user or group identified in one of these certification schedule fields:
  - Assign to
  - User
  - Assign to group
  - Group
- Places the new tasks in the Work in Progress state.
- Adds the certification schedule Short description and Assigned to values to the corresponding fields on the certification task record.
- Adds the certification schedule Days to complete and Complete by date fields to the certification task record, based on when the task is created.
Note: If the certification filter does not match any CIs, the system sets the State to Closed Complete and the Percent complete to 100.

To view tasks assigned to you, navigate to Data Certification Tasks My Tasks.

The following information is tracked on the certification task record:

Table 70: Certification task record

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>An identification number for the certification task.</td>
</tr>
<tr>
<td>Assigned to</td>
<td>The user responsible for certifying the data.</td>
</tr>
<tr>
<td>Assignment group</td>
<td>The group responsible for certifying the data.</td>
</tr>
<tr>
<td>Complete by</td>
<td>[Read-only] A date field containing a deadline for the task. This field is automatically filled in based on the Days to Complete field on the certification schedule.</td>
</tr>
<tr>
<td>State</td>
<td>[Read-only] The current state of the certification task. The selections are: Work in Progress, Closed Incomplete, Closed Complete, and Cancelled.</td>
</tr>
<tr>
<td>Percent complete</td>
<td>The task progress as a percentage. This field is read-only when a task is in a Closed Incomplete, Closed Complete, or Cancelled state.</td>
</tr>
<tr>
<td>Escalation</td>
<td>[Read-only] The escalation level of the task. When 0–49% of the time to Complete By has elapsed, this field is set to Normal. At 50%, this field changes to Moderate and an email reminder is sent to the task owner. At 75%, this field changes to High and an email reminder are sent to the task owner and the manager of the task owner. At 95%, this field remains set to High, but a second email reminder is sent to the task owner and manager.</td>
</tr>
<tr>
<td>Short Description</td>
<td>A short description of the task. This field is automatically filled in with the text from the certification schedule of the Task description field.</td>
</tr>
<tr>
<td>Work notes</td>
<td>Information about work performed on the certification.</td>
</tr>
</tbody>
</table>

Export the certification list

Users with the certification_admin role can export the certifications list and save the list in Excel, CSV, XML, or PDF format. This list is useful when you have a long list of certification elements or if many different users are assigned to certify elements on a single certification schedule.

For general information and common export steps, see List export.

1. Navigate to Data Certification Tasks All Tasks
2. Open a task.
3. Open any column context menu in the certification data list and complete the export.

Certify an element

The Certification Task form contains a list of all elements to be certified.

**Note:** After you certify all the elements in a task, no elements can be reverted.

1. Navigate to Data Certification Tasks My Tasks.
2. Open a certification task with a State of Work in Progress.
3. In the upper right corner of the list, select records that require certification for this task or all records that are part of this certification task.

4. Select the check box beside a certification element.
5. In Optional comment for checked elements, above the list, enter information that would be useful to others.

![Figure 78: Certification list 3](image)
6. Do:
   - Click the green check mark to certify the element.
   - Click the red exclamation point to fail the element.

7. To see the certified or failed element, set the view to Show All Records.
   A green check mark or red exclamation mark appears beside the element.

8. Point to an icon to see any certification comments.
9. Ensure that all elements have the correct certification, either accepted or rejected.
   After you certify all elements, no elements can be reverted. When all elements of a certification task are certified or rejected, the task State changes to Closed Complete.

View an audit result

View audit results after you certify the elements.

1. Navigate to Data Certification Schedules Audit Results.
   The list of data certification audit results appears, grouped by certification instances. Certified configuration items show the Original value only. Failed CIs contain the Certified value and the Original value.

2. Click the links in the list to open any of the related records.
Figure 80: Data cert audit results

Reset certifications

You cannot reset any element after all elements are certified.

• To reset individual certifications, right-click the element in the certification list and select Revert Certification.
• To reset the entire task to its starting point, click the Reset all Certifications to Pending related link.

Track a task with a certification instance

The Certification Tasks related list on the certification instance record provides information about associated tasks.
The State field on the certification instance record is read-only and is based on the cumulative states of the certification tasks associated with the instance. The Percent complete column allows users with the certification_admin role to track task progress quickly. For more information, see Track Certification Tasks.

To track a certification instance:

1. Navigate to Data Certification Schedules Instances.
2. Click a certification instance Number.
3. View and edit the following fields as necessary.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>[Read-only] Automatically generated identification number for the instance.</td>
</tr>
<tr>
<td>Certification Schedule</td>
<td>The certification schedule used to create the certification instance.</td>
</tr>
<tr>
<td>State</td>
<td>[Read-only] Current state of the certification instance: Work in Progress, Complete, Closed Incomplete, or Cancelled. For more information, see Track Certification Tasks.</td>
</tr>
<tr>
<td>Created</td>
<td>[Read-only] Date and time the certification instance was created. Date is filled in automatically when the Execute Now button clicks the associated certification schedule.</td>
</tr>
<tr>
<td>Complete by</td>
<td>[Required] Date and time when the certification instance must be completed. The system updates this field when it executes the schedule, using the deadline specified on the instance. All certification tasks associated with the certification instance must be marked Complete, Closed Incomplete, or Cancelled before the instance is complete.</td>
</tr>
<tr>
<td>Percent complete</td>
<td>Percentage of the instance that has reached the Closed Complete state. This field is automatically filled in based on the Percent Complete fields on the associated certification tasks.</td>
</tr>
<tr>
<td>Task Description</td>
<td>Information about the certification instance. This field automatically displays the text from the Task description field of the associated certification schedule.</td>
</tr>
<tr>
<td>Instructions</td>
<td>Field for providing instructions to the user or group performing the certification. This field is automatically filled in with information from the Instructions field on the associated certification schedule.</td>
</tr>
</tbody>
</table>
Cancel a certification instance

Users with the certification_admin role can cancel a certification instance. The instance must have a State of Work in Progress. Canceling a certification instance:

- Changes the certification instance State to Cancelled.
- Changes all associated Work in Progress certification tasks to Cancelled.

To cancel a certification instance:
1. Navigate to Data Certification Schedules Instances.
2. Click a certification instance Number.
3. Click Cancel.

Track a certification task

Use the certification task state to track the progress of a task. The available task states are Work in Progress, Closed Complete, Closed Incomplete, and Cancelled.

When the state of a certification task changes, the certification instance state also changes in the following cases:

- If any certification task is in Work in Progress state, the certification instance is placed in Work in Progress state.
- If all certification tasks are in Cancelled state, the certification instance is placed in Cancelled state.
- If all certification tasks are in Cancelled or Closed Complete state, the instance is placed in a Closed Complete state. For example, if three certification tasks are Cancelled, and one task is Closed Complete, the instance state is changed to Closed Complete.
- When one certification task is Closed Incomplete and the remainder of the tasks are Cancelled or Closed Complete, the instance is placed in Closed Incomplete.

To view the state of certification tasks:
1. Navigate to Data Certification Tasks and select My Tasks or All Tasks.
2. View the State column for each task.

Escalate a certification task

Users with the certification_admin role can escalate a task in the Work in Progress state. To escalate a task, the task owner identified in the Assigned to field on the task record must have an associated manager.

Personalize the User form to see the Manager field.

Escalating a task:

- Sends an email message to the task owner and the manager of the task owner stating that the task has been escalated.
- Sets the manager as the new task owner.

The event that triggers the escalation is named cert_task.escalate and the email notification is named Escalation Notification. To edit the text of the email message that is sent, edit the Escalation Notification email notification directly.

For more information, see Email and SMS notifications on page 596.
To escalate a certification task from the Certification Task form:
1. Navigate to Data Certification Tasks All Tasks.
2. Click a certification task Number.
3. Click Escalate. If the Escalate button is not available, the user in the Assigned to field does not have an associated Manager.

### Escalate a certification task from the certification task list

Escalate a certification task to notify the manager of the current task owner.

To escalate a task, the task owner identified in the Assigned to field on the task record must have an associated manager.
1. Navigate to Data Certification Tasks All Tasks.
2. Select the check box to the left of a certification task Number. Multiple check boxes can be selected.
3. From the Actions on Selected Rows menu below the list, select Escalate. If the Escalate button is not available, the user in the Assigned to field does not have an associated Manager. Select multiple tasks from the list. The menu option shows how many tasks are not eligible for escalation, such as Escalate (4 of 6).

### Reassign a certification task

If you have the certification_admin role, you can reassign any certification task in the Work in Progress state. Tasks in Closed Complete, Closed Incomplete, or Cancelled state cannot be reassigned. When a task is reassigned, the current task owner and the new task owner are sent a message.

Role required: certification_admin

The event associated with the reassignment is named cert_task.reassign and the email notification is named Certification Task Reassignment. To edit the text of the email message that is sent, edit the Certification Task Reassignment email notification directly.

For more information, see Email and SMS notifications on page 596.

To reassign a certification task:
1. Navigate to Data Certification Tasks All Tasks.
2. Click a certification task Number.
3. Enter a new name in the Assigned to field.

### Send certification task reminders

The Certification Task Escalations workflow sends automatic email reminders.

The Certification Task Escalations workflow sends automatic email reminders to the:

- Certification task owner.
- Assignment group, if the assignment group was specified on the Certification Task form.
- Manager of the certification task owner, if necessary and if a manager was specified on the User form.

The reminders are based on the Complete by field on the certification task record. If the Complete by date is changed, the reminder schedule automatically adjusts to reflect the new date.
Table 72: Certification task reminders

<table>
<thead>
<tr>
<th>Time elapsed to end date</th>
<th>Email reminder is sent to</th>
<th>Escalate field on task record reads</th>
</tr>
</thead>
<tbody>
<tr>
<td>50%</td>
<td>task owner and assignment group (if specified)</td>
<td>Moderate</td>
</tr>
<tr>
<td>75%</td>
<td>task owner, assignment group, and manager of the task owner</td>
<td>High</td>
</tr>
<tr>
<td>95%</td>
<td>task owner, assignment group, and manager of the task owner</td>
<td>High</td>
</tr>
<tr>
<td>100%</td>
<td>task owner, assignment group, and manager of the task owner</td>
<td>High</td>
</tr>
</tbody>
</table>

To set reminders for different or more intervals, edit the workflow Certification Task Escalations. In addition to the email reminders sent automatically, users with the certification_admin role can send email reminders manually at any time.

Send an email reminder from the certification task form

How to manually send email reminders from the Certification Task form.
1. Navigate to Data Certification Tasks All Tasks.
2. Click a certification task Number.
3. Right-click the header bar and select Resend email notifications.

Send an email reminder from the certification task list

How to manually send email reminders from the Certification Task list.
1. Navigate to Data Certification Tasks All Tasks.
2. Select the check box to the left of a certification task Number. Multiple check boxes can be selected.
3. From the Actions on Selected Rows menu below the list, select Resend email notifications. Select multiple tasks from the list. The menu option shows how many notifications are outstanding and how many were sent, such as Resend email notifications (15 of 18).

Mark a certification task as closed incomplete

Mark a task as closed incomplete if, for example, only some of the elements can be certified. The following users can mark a task as closed incomplete:
- Users with the certification_admin role.
- User identified in the Assigned to field on the certification task record.

To mark a task as closed incomplete:
1. Navigate to Data Certification Tasks and select All Tasks, or My Tasks.
2. Click a certification task Number.
3. In Work Notes, enter information about why the task could not be completed.
4. Click Close Incomplete.
If at least one task on a certification instance is marked Closed Incomplete, the Completed date and Percent complete fields on the certification instance record are not updated. A user with the certification_admin role can:

- Complete the incomplete task or tasks.
- Cancel the incomplete task or tasks.

When all tasks on the certification instance are Closed Complete or Cancelled:

- The system sets the Completed date field on the certification instance record to the current date and time.
- The Percent complete field on the certification instance record is set to 100 percent.

Certification tasks cancellation

Users with the certification_admin role can cancel a certification task in the Work in Progress or Closed Incomplete state.

When a certification task is cancelled, a notification email is sent to the task owner or assignment group assigned to the task. The task owner or assignment group manager is not notified.

Cancel an individual task

Cancel a particular data certification task in the Work in Progress state.

1. Navigate to Data Certification Tasks All Tasks.
2. Find a task with a State of Work in Progress.
3. Click the task Number.
4. Click Cancel.

Cancel all tasks in an instance

Cancel data certification tasks in the Work in Progress state.

1. Navigate to Data Certification Schedules Instances.
2. Find an instance with a State of Work in Progress.
3. Click the instance Number.
4. Click Cancel.

All tasks in the instance with a state of Work in Progress are cancelled. The task owner or assignment group is notified.

The email template used for the notification is named certification.task.cancelled. The email templates can be edited to change the email message text, for example.

Domain separation and Data Certification

This is an overview of domain separation and Data Certification processing. Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.
Overview

Support: Data only

Domain separation in this application is supported at the Data only level, meaning it supports the data security model of separating visibility of data from one domain to another. To learn more, see Application support for domain separation.

Content Management System

The Content Management System (CMS) is a ServiceNow application that primarily enables users to create a custom interface for the ServiceNow platform and ServiceNow applications.

The CMS application is powerful and flexible. Customers use it for a wide variety of projects, from creating entire websites to integrating with other products. The Content Management application is active by default.

This video provides an overview of the CMS application.

A CMS typically requires a systems administrator or a web developer to set up and add features. Non-technical users can use the CMS application as a tool for website maintenance. You also want to consider the timing of the addition of content management, and the maturity level of ServiceNow data. For more information, see CMS Planning.

Following are several CMS project ideas:

• Design a company-wide service catalog that offers a collection of services.
• Present a customized UI for a knowledge base.
• Create customized login pages, search pages, views of lists, tables, charts, or graphs.
• Design a complete website.
• Integrate ServiceNow with other company applications.
• Build a tailored self-service portal for end users that is in compliance with a corporate style guide.

Example CMS sites

There are two common interface approaches within the ServiceNow community:

• An image and text-based interface similar to Amazon.com
• A search-based interface similar to Google

Both approaches have been used successfully. The approach you select depends on the needs of the people using the data and how easy it is to train them. While the two design philosophies are different, both approaches share the common goal of UI simplicity.

Content Management design

Before building a website in the CMS, it is important to have a good understanding of what to build and who the audience is.

A high volume of content can heavily influence the look and feel of the site and the site hierarchy. When deciding the content, design for ease of maintenance for the people who take care of the system. This level of planning can be time-consuming, but is important.
Review website design prerequisites to help you set expectations, scope deliverables, and define reasonable time lines. Consider both the planning and execution of site design, to understand how sites are built, and to provide a working overview of the CMS.

Timing is important when considering the addition of content management. Successful deployments of the content management system usually take place after phase 1 processes (for example, Incident, Problem, Change, Catalog, and Knowledge) are in place. This is especially true if the team has limited website design experience. Waiting until phase 2 of deployment gives administrators time to work in ServiceNow and to understand how the organization uses the system and what business needs it meets.

Also consider the maturity level of data in the ServiceNow system. Depending on the ITIL processes used, content management is only useful and effective once the data within ServiceNow is established. Ensure that hierarchies, tasks, and workflows are well-defined. For example, before creating a catalog interface, confirm that the service catalog has been in place for some time, has been used, and contains data. The same is true for a knowledge management interface, particularly when high ratings or view counts define article placement on the page.

**Content organization**

Before you begin to build the CMS website, list all the content that you want to include and take the time to organize it.

A site created in CMS relies on two different types of content.

- CMS site information, such as site pages, images, and menus
- System information, such as knowledge base articles and catalog items

**CMS content**

Begin by listing all the content you want to host on the CMS pages. Examples include help pages, My Requests, My Approvals, and specific catalog items. Think about current solutions that you can implement immediately, and note ideas for future implementation phases.

Within CMS, you group pages to define the top-down menu structure. You establish a home or starting page, and other pages in the site reference the home page in the Parent Page reference field.

There are several ways to group, such as by audience or the purpose of the website. After listing the content to host, group it logically and identify a common name for each group, as shown in the following examples.

<table>
<thead>
<tr>
<th>Table 73: IT environment groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content built for</td>
</tr>
<tr>
<td>End user</td>
</tr>
<tr>
<td>IT professional</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 74: General groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose of site</td>
</tr>
<tr>
<td>Reports</td>
</tr>
<tr>
<td>Help and knowledge</td>
</tr>
</tbody>
</table>
System content

Organize the content so the interface is easy to navigate and understandable to the user. Determine the organization based on the data that you are leveraging, both in the CMS (using sites, parent pages, pages, and navigational menus) and throughout the rest of the system. For example, within the catalog you have "category," and in the knowledge base you have "category" and "subcategory." You can use these hierarchies with filtered lists for good search results.

Organizing CMS content logically is important for long-term maintenance of the site, however, the data typically comes from other ServiceNow applications. Communicate with the administrators for these applications, such as the knowledge base, service catalog, and business service portfolio. Work with them to offer the application data appropriately through the CMS pages you create. For example, the team that created the ServiceNow corporate website in CMS began by evaluating the naming conventions used in the corporate knowledge base.

Branding elements

Branding refers to the logo, name, colors, and symbols that identify an organization. It imposes consistency in design and use of terms. Your marketing department defines branding elements and can provide them to you as you plan your CMS pages. Consider how to incorporate the following branding elements.

- Logos
- Color palette
- Tag line
- Trademarked elements
- Graphics

Site design

During planning, consider providing a core set of features with a standard appearance throughout the site. The following web design elements are often used to create a consistent look.

- Page templates
- Navigation schemes
- Header
- Breadcrumbs
- Footer
- Forms

ServiceNow features

Analyze and organize the following ServiceNow features in your instance if you plan on using any of them with CMS pages.

- Account settings
- Email
- Workflow approvals
- Filters
Team member identification

Identify the team members who assist you with website design, branding, and development.

Engage team members for each listed function before you begin to build pages for the CMS website. Each function can be performed by the same or different people.

- Gather corporate style design guidelines.
- Define the written terminology and content for the site.
- Gather and define the site flow.
- Manage the CMS project as the webmaster. The CMS webmaster is responsible for executing the design and making the site work. The following skills are required:
  - Basic ServiceNow administration skills
  - HTML
  - CSS
  - Graphic design
  - Web design

After you identify the project team members, establish who is responsible to complete the tasks involved in building the CMS website.

- Determine who owns each page.
- Set a page update schedule so owners do not overwrite each other.
- Formalize content management processes, including content review and page updates.

Data preparation

It is important that there is enough data in the ServiceNow instance before you begin to build the CMS website.

Ensure that the necessary data and content are available in the instance by taking the following actions.

- Review the ITIL processes that you intend to implement in the CMS. Ensure that the data in the instance is a mature representation of the applications being used, for example, service catalog, knowledge management, and incident management.
- Review the defined hierarchies, such as the categories and subcategories for the knowledge base or service catalog. You use these categories to design the entry page into the application.

Corporate style guide

When you build a CMS website, you design the look and feel based on guidelines in the corporate style guide.

A corporate style guide provides detailed information for designing any corporate interface, including corporate websites.

Corporate design team

Many organizations have a web development team that designed the corporate website. Contact this team and involve the designers early in the planning, as they provide help and give their approval to the interface you design. Without approval, there is the risk of having to redesign the entire site because it does not adhere to the organizational guidelines.
Corporate style guide

A corporate style guide takes the guesswork out of designing the CMS website. The example style guide shown is defined down to the pixel. Creating a site with the style guide makes it easy to create clean CSS and HTML. Without the style guide, building the site can take a great deal of time.

Design considerations

Some modifications to the base design for forms may be necessary. The content area of any CMS design should be no smaller than 860px, or service catalog forms are clipped. The sample style guide entry specifies the content area to be 576px, which clips service catalog forms.
Columns and topics:

1. Navigation (levels 2–4)
2. Main content
3. Info snippets
Prototypes and rapid web design

Many user interface designers use prototypes and rapid web design techniques to visualize the final product before it is developed.

Design revisions are the most time consuming and expensive phase of site design. When the team analyzes and then uses prototypes to create pages, revisions to the published pages are minimal.

Develop the prototype and print it. Review the design with the appropriate team members and annotate the prototype, and annotate what to update on each page.

Define the following elements within the prototype.

- The site map for the entire site.
- A detailed prototype of every intended page, including elements such as links, link destinations, content, page names, and page descriptions.

Content Management navigation

After you design the hierarchical structure of the site, begin planning site navigation.

Consider the following as you plan site navigation.

- Placing navigation elements on every page.
- Locating navigation elements in the same place on every page.
- Using either text or images for navigation.
- Providing visitors with an easy way to understand where they are in the site, for example, with breadcrumbs or a specific color scheme.
- Adding a site map, which is a one-page, hyperlinked, hierarchical outline of the site.
- Providing a link to the home page from every site page, as visitors often enter the site on a page other than the home page.
- Designing navigation to help visitors find information quickly with as few clicks as possible.

In the CMS, navigation menus define your site navigation. Build menus as navigational blocks to create navigation paths. The menu chosen for the task depends on the size and complexity of your site. Available menu options include the following items.

- List menus
- Two types of tab menus
- Vertical, clickable list, usually placed on the left side
- Horizontal blocks
- Vertical blocks
- Super menu (a menu of menus)

System content management

Most of the content in a CMS site is managed in different locations throughout the system.

For example, if you are building a knowledge website, the pages and blocks exist in CMS, but the knowledge articles are authored and managed in the Knowledge application. The same is true for any other type of content you plan to leverage. It is important to take time to understand the table structure of data to become acquainted with content.

Links to content are typically static, however, take time to look at the document tree and review how field values are formatted for use within the CMS. To understand the information provided below, right-click within forms in the platform and select Show XML to view the document tree for the referenced table. To
see the table values for each field, right-click the form label and choose Show - (field name) or Configure
Dictionary for reference.

Look at several internet news sites for ideas on how to format dynamic list data and also the full article
detail. Research blog sites, shopping sites, and any other site you find easy to use, as layout and usability
design can be time-consuming. If you find a site that inspires you, emulate it in your design.

- This New York Times example has two separate list formats.
- The CNN example has several list formats on the page.
- Several different list formats are used on the ServiceNow website.

Knowledge articles - kb_knowledge table

When you right-click and select Show XML on any form within the system, the document tree for the
referenced database table becomes reference-able. Review the following selected subset of the document
tree so you can acquaint yourself with the content readily available to your site design.

```xml
<kb_knowledge>
  <active>true</active>
  <author display_value= "First Last Name" >Use this field value if author name is important </author>
  <short_description>Use this field value as the link to the full article detail </short_description>
  <description>Provide this field value as a 1-2 sentence summary of the article </description>
  <number>Unique ID can be leveraged in a number of different ways </number>
  <published>Published time stamp of the article </published>
  <rating>This field value provides a 1 to 5 star rating similar to iTunes </rating>
  <sys_updated_on>Add to supplement article published timestamp </sys_updated_on>
  <sys_view_count>8</sys_view_count>
  <topic>Useful field value in creating hierarchical breadcrumbs </topic>
  <category>Also useful in organizing articles hierarchically </category>
  <use_count>Use this similar to Facebook's "like" feedback, answer to the question was this useful </use_count>
</kb_knowledge>
```

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Domain separation in the Content Management System

This is an overview of domain separation in the Content Management System. Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.

Overview

Support: Data only

Domain separation in this application is supported at the Data only level, meaning it supports the data security model of separating visibility of data from one domain to another. To learn more, see Application support for domain separation.

Activate the Content Management System

The Content Management System (CMS) application and the Service Management Portal application, which is implemented within Content Management, are automatically installed on new instances. If they are not active on your instance, administrators can activate them.

Role required: admin

For evaluation, you can activate the plugin for an application that requires a purchased subscription on a non-production instance. To activate the plugin on production instances, you must purchase the subscription. To purchase a subscription, contact your ServiceNow account manager. For details on purchasing a plugin, see Purchase a plugin.

Some plugins require activation by ServiceNow personnel. Request these plugins through the HI Customer Service System instead of activating them yourself. For details, see Request a plugin.

For plugins that you can activate yourself, continue with the following steps.

1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.

If the plugin depends on other plugins, these plugins are listed along with their activation status.
If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).

4. If available, select the Load demo data check box.

Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.

You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.

5. Click Activate.

Installed with Content Management

Several types of components are installed with the Content Management application.

Demo data is available for this feature.

Tables installed with Content Management

Tables are added with activation of Content Management.

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content Page [content_page]</td>
<td>Provides an inventory list of pages within the system</td>
</tr>
<tr>
<td>Content Css [content_css]</td>
<td>Stores internal or external CSS for the page</td>
</tr>
<tr>
<td>Content Theme [content_theme]</td>
<td>Made up of a collection of CSS files</td>
</tr>
<tr>
<td>Content Link [content_link]</td>
<td></td>
</tr>
<tr>
<td>Content Page Rule [content_page_rule]</td>
<td></td>
</tr>
<tr>
<td>Content Block Programmatic [content_block_programmatic]</td>
<td></td>
</tr>
<tr>
<td>Content Block [content_block]</td>
<td></td>
</tr>
<tr>
<td>Content Block Detail [content_block_detail]</td>
<td></td>
</tr>
<tr>
<td>Content Site [content_site]</td>
<td>Provides and inventory list of sites within the system</td>
</tr>
</tbody>
</table>
### Roles installed with Content Management

Roles are added with activation of Content Management.

<table>
<thead>
<tr>
<th>Role title [name]</th>
<th>Description</th>
<th>Contains roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content administrator [content_admin]</td>
<td>Can read, write, and configure all elements of the Content Management Application</td>
<td>none</td>
</tr>
</tbody>
</table>

### Script includes installed with Content Management

Script includes are added with activation of Content Management.

<table>
<thead>
<tr>
<th>Script include</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMSCopyAjax</td>
<td>Support for copying CMS pages</td>
</tr>
<tr>
<td>CMSEntryPage</td>
<td>Creates an entry page</td>
</tr>
<tr>
<td>ContentPageClone</td>
<td>Copy support for CMS pages</td>
</tr>
<tr>
<td>ContentSiteClone</td>
<td>Copy support for CMS sites</td>
</tr>
<tr>
<td>CMSAjax</td>
<td>CMS Ajax utilities</td>
</tr>
</tbody>
</table>
Client scripts installed with Content Management

Client scripts are added with activation of Content Management.

<table>
<thead>
<tr>
<th>Client script</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Header Color Change</td>
<td>Content Block Header</td>
<td>Changes the background color of the control to what the user selected</td>
</tr>
<tr>
<td></td>
<td>[content_block_header]</td>
<td></td>
</tr>
</tbody>
</table>

Business Rules installed with Content Management

Business Rules are added with activation of Content Management.

<table>
<thead>
<tr>
<th>Business rule</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replace Stub</td>
<td>Content Block</td>
<td>Replaces a placeholder widget with a content widget.</td>
</tr>
<tr>
<td></td>
<td>[content_block]</td>
<td></td>
</tr>
<tr>
<td>Unload Page</td>
<td>Page</td>
<td>Unloads content from the page.</td>
</tr>
<tr>
<td></td>
<td>[content_page]</td>
<td></td>
</tr>
<tr>
<td>Bump Parent if Content</td>
<td>Portal</td>
<td>Replace content in the current page.</td>
</tr>
<tr>
<td></td>
<td>[sys_portal]</td>
<td></td>
</tr>
<tr>
<td>Remove Block from Pages</td>
<td>Content Block</td>
<td>Removes a block from pages where it is placed.</td>
</tr>
<tr>
<td></td>
<td>[content_block]</td>
<td></td>
</tr>
<tr>
<td>Validate Suffix</td>
<td>Content Page</td>
<td>Validates a suffix so that a page name or a page suffix cannot match a table name.</td>
</tr>
<tr>
<td></td>
<td>[content_page]</td>
<td></td>
</tr>
</tbody>
</table>

Configure Content Management sites

Planning a CMS site involves obtaining resources, communicating with others about design, and gathering content.

Role required: content_admin or admin

The following steps are a high-level overview of how to set up a site.

1. Plan and design your content.
2. Create a site.
   The site is the container that holds all the content. To simplify your process, you can copy an existing site and edit its components. For more information on creating a site, see Create a site on page 401. For more information on copying a site, see Copy a site on page 403.
3. Add pages to the site.
   Pages contain blocks of information for the site. For more information, see Create a content page on page 405.
4. Create content blocks to customize the layout, headers, menu navigation, lists, and static and dynamic content.
Content blocks are chunks of actual HTML that make up the content page. There are various content block types available to help with your customization. For more information, see Content blocks on page 416.

5. Add style to your site using themes, style sheets, and frames.
Neither content sites or content pages reference style sheets directly. Configure them using the Themes or Style Sheets options. For more information, see Style in Content Management on page 446.

6. Test the site.
After you create or modify a site, test the site to ensure that content displays properly and all links work correctly. For more information, see Test the site.

Content sites
A content site is a group of related content pages that have the same basic theme, layout, and URL suffix.

Content sites are made up of a series of basic building blocks. The Employee Self-Service site is an out-of-box sample site that is included in the CMS activation. It provides existing, working examples or each CMS component, which you can use like a template to build your own site.

![Site components diagram]

Figure 82: Site components
Create a site

Configure a site by either creating a new site with CMS or by editing a copy of either the ESS Portal or the Service Management Portal.

Role required: content_admin or admin

If you are creating a catalog site in CMS, follow the steps in Manage catalog sites in Service Catalog

1. Navigate to Content Management Sites.
2. Click New.
3. Complete the form.

Since you have not yet created pages, you cannot select the Home, Search, Login, and Gauge target pages. Add them to the site record after you create them.

Table 75: Site fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>A unique name for the site.</td>
</tr>
<tr>
<td>URL suffix</td>
<td>The URL suffix that identifies the site. The URL suffix is case-sensitive,</td>
</tr>
<tr>
<td></td>
<td>the suffix you enter impacts the CMS site URL used to launch the site. The</td>
</tr>
<tr>
<td></td>
<td>URL as follows: http://&lt;instance name&gt;.service-now.com/url_suffix/page.do</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Do not use portal and cms in the URL suffix. They are reserved</td>
</tr>
<tr>
<td></td>
<td>terms and return a Page not found if you use them.</td>
</tr>
<tr>
<td>Home page</td>
<td>The page to display when the user does not specify a page name in their URL:</td>
</tr>
<tr>
<td></td>
<td>http://&lt;instance name&gt;.service-now.com/url_suffix/</td>
</tr>
<tr>
<td>Search page</td>
<td>The page that displays search results when a user searches from any page</td>
</tr>
<tr>
<td></td>
<td>within the site.</td>
</tr>
<tr>
<td>Login page</td>
<td>The page to use for logging in to the site. If specified, users must log</td>
</tr>
<tr>
<td></td>
<td>in to access the pages on the site. If left blank, no login is required to</td>
</tr>
<tr>
<td></td>
<td>access the pages within the site.</td>
</tr>
<tr>
<td>Gauge target page</td>
<td>The page that displays gauge content. When the user clicks a gauge on the</td>
</tr>
<tr>
<td></td>
<td>new site, the gauge target page opens to show the gauge content. The gauge</td>
</tr>
<tr>
<td></td>
<td>target page replaces the CMS page in the current tab.</td>
</tr>
<tr>
<td>Title</td>
<td>A title for the site. The title can be the same as or different from the</td>
</tr>
<tr>
<td></td>
<td>Name.</td>
</tr>
</tbody>
</table>
4. Click Submit.

The following is the site record for the ESS Portal:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>A full description of the site.</td>
</tr>
<tr>
<td>Default layout</td>
<td>The layout for pages to use by default. Any page in the site that has a blank Layout field uses the layout selected in this field.</td>
</tr>
<tr>
<td>Default theme</td>
<td>The theme for pages to use by default. Any page in the site that has a blank Theme field uses the theme selected in this field.</td>
</tr>
<tr>
<td>Simple catalog display</td>
<td>Selecting this option simplifies catalog pages in the site by hiding the search bar, breadcrumbs, and the results per page choice list. It also prevents you from adding attachments from record producers to your CMS site.</td>
</tr>
<tr>
<td>Use external cart</td>
<td>Option to omit the default cart when rendering catalog pages within a site that contains catalog pages. Provide a catalog cart block somewhere on the site to allow users to make catalog requests. Note: If you use an external cart, the no cart check box on a service catalog item has no effect. The external cart appears for all items.</td>
</tr>
</tbody>
</table>

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Copy a site

To create a new site quickly, you can copy an existing site.

Role required: content_admin or admin

The site copy option creates a complete standalone copy of the site and all its resources. If you are copying a site to create a second site, use this option after the first site is complete, tested, and production ready. This consideration is important because the blocks, CSS, and pages are duplicated to support the new site. There are various reasons why site copying is useful, such as site versioning, branding, or creating a backup.
Images are not included when you use the Copy Site option. They are stored separately in the sys_attachments table.

To copy just a few pages without duplicating all the resources (CSS, blocks, menus), use the page copy option. Page copy duplicates the page but not the resources used in the page. For more information, see Copy a page.

1. Navigate to Content Management Sites [Site Name].
2. On the Site form, click Copy.
3. In the dialog box that opens, type a name for the new site.
   This name is a prefix for all the site elements that are duplicated. Do not use Portal or CMS in the site name.
   A progress bar shows the copy process. When the process is complete, the Site form shows information for the new site.

Content Management security

There are several methods for securing CMS sites and pages. Site security is set in the Login page field on the site record. You can control if a page is public or private through the URL.

Every content page has its own URL that users can access outside of the platform. Depending on how the Login page or roles are defined, the URL may or may not be public.

- If the content page has no defined Read role or there is no defined Login page, any internet user can navigate to the URL and view the content page.
- If there is a defined Read role, then anyone who goes to the URL is asked to log in before they can view the site.
- If there is a defined Login page on the site record, all pages in the site are private.

Content Management URLs

The format for Content Management URLs is as follows.

<path to the instance> + /<site suffix> + /<page suffix> + .do

The <site suffix> is defined by the URL Suffix field on the site form. The <page suffix> is defined by the URL Suffix field in the page form. The URL suffix is case-sensitive.

For example, the page Austere - Site Entry has a site URL Suffix of austere and a page URL Suffix of entry. The constructed URL looks like the following URL.

<instance name>.service-now.com/austere/entry.do

If the site URL Suffix field is left blank, the <site suffix> is cms, as shown in this example:

instance.service-now.com/cms/page.do

If the page URL Suffix is left blank, the name of the page is used as shown in this example:

instance.service-now.com/austere/Page Name.do

Special characters in the name of the page have to be escaped.

Login pages instead of login rules

You set a login page on the site record to allow users to log in or out directly through the content site.
Login rules were used in earlier versions to dictate what users saw after logging in, based on their roles or permissions. Login rules still work, but their use is deprecated.

Configure CMS sites to use single sign-on (SSO)

To configure CMS to use SSO, make the view_content page private.

Because public pages do not require login, and CMS sites are public by default, CMS pages do not use SSO. Use the following procedure to turn off public-facing content pages and enable SSO.

1. Navigate to Public Pages [sys_public.list].
2. For the view_content page, set Active to false.

Content pages in CMS

Content pages are the core of the Content Management System. A content page is a web page that displays blocks of content.

Pages are built from content blocks and organized into sites. Pages display as regular webpages that are rendered in HTML. Constructing a content page requires a basic knowledge of HTML. Content pages are formed by arranging content blocks in predefined layouts. They can be used to present login pages, search pages, or ServiceNow content.

Create a content page

Pages are built from content blocks and organized into sites.

Role required: content_admin or admin

1. Navigate to Content Management Sites.
2. Open the site to add the page.
3. In the Pages related list, click New.
4. Complete the form.

Table 76: Page form fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>A unique name for the page. Prefix each page name with the name of the site followed by a dash and the page function. For example, ESS - Catalog Detail and ESS - Search Results are page names within the ESS site.</td>
</tr>
<tr>
<td>URL suffix</td>
<td>The URL suffix that identifies the page. It is incorporated into the URL as follows: <a href="http://instance">http://instance</a> name.service-now.com/site/url_suffix.do</td>
</tr>
<tr>
<td>Parent page</td>
<td>The existing page that is the parent of the current page. Parent pages keep sections sortable on the site list of pages and are used to create breadcrumbs dynamically. Use CSS to define menus that give the Parent page context within the user interface.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Layout</td>
<td>The layout to use for the page. Layouts define dropzones where content blocks can be added to the page. If this field is left blank, the page inherits the default layout of the site. If the site does not have a default layout, there is a single dropzone for the entire page.</td>
</tr>
<tr>
<td>Content theme</td>
<td>The theme to use for the page. Themes bundle CSS style sheets that are applied to all content within the page. If this field is left blank, the page inherits the default theme of the site. Use the default theme unless the page requires a different set of CSS style sheets from the other pages in the site.</td>
</tr>
<tr>
<td>Frame buster</td>
<td>Select the check box to remove any restrictions placed by frames that contain the page. This way you avoid frame-within-frame issues that sometimes occur with improper linking.</td>
</tr>
</tbody>
</table>
| Content site        | The site associated with the content page. If you created the page from the related list in the site, the value defaults. The content site provides the `<site_suffix>` in the page URL, as follows:  
  `http://<instance name>.service-now.com/site_suffix/page_suffix.do` |
| Read roles          | Users with the selected roles can view the page. Click the lock icon to select roles. |
| Model document      | A document ID of a record to display by default. |
| Page status         | The status for the page, such as Draft or Published. |
| Created by          | The user who created the page. If your role has higher privileges than your user name and you enter your user name, the field defaults to the role. For example, if you are logged in as an Admin and you type your name, which has lower privileges, this field displays Admin. |
| Title               | The title for the page. The title displays on the browser tab when the page is accessed. |
| Description         | Type a description of the page that displays for users when they access the page. |

5. Click Submit.
Add content to a page

After you define the page settings, set the content of the page by adding content blocks. Setting content blocks is similar to how you add content to homepages.

Role required: content_admin or admin

| Note: | Do not add any type of report, such as a calendar, to iFrames. For more information on adding a report directly onto a page without using iFrames, see Embedding reports in Jelly. |

2. Click Add Content.
3. Select a content block from the picker.
4. Select the dropzone where the content goes.
   Create content blocks by adding one of the content blocks named *New [block type] to the page.
A Detail block displays the content of an existing document. For example, the detail of a Knowledge Base article will display that article, while the detail of a Service Catalog request will display the request itself.
Copy a page

Copying pages is an efficient way to avoid duplicating the same work and to create pages quickly from a
guiding master template.

Role required: content_admin or admin

1. Navigate to Content Management Sites and select the site.
2. Select the page to copy.
3. Click Copy.
4. Rename the page.

**Note:** Do not use service_catalog to rename a page. It is already a valid page in the system.

5. Edit the page fields.
6. Click Update.

Assign a page to a site

If you have created multiple sites, you can add pages from one site to another site.

Role required: content_admin or admin

1. Navigate to Content Management Sites.
2. Select a site.
3. In the Pages related list, click Edit.
4. Select other pages to include in the site.
5. Click Save.
6. Update the site.

Add a page to an application

Homepages and content pages are not added automatically to update sets and applications. They must be
manually added.

Role required: content_admin or admin

1. Navigate to Content Management Pages.
2. Right-click a content page record.

The page is added to the current application and to the current update set.

Configure a private UI page for CMS links

With single sign-on (SSO) in place, you can generate email links that take users directly to tickets and
applications through the CMS interface.

Role required: content_admin or admin

You accomplish this procedure by creating a private UI page to redirect CMS links. Because the page is
not public, it requires authentication and redirects to SSO appropriately.

1. Check that your CMS site is private by completing the following steps.
   a) Navigate to Content Management Sites [Your Site]
   b) Verify that the Login page field has a page listed.
2. Create a new UI page by completing the following steps.
   a) Navigate to System UI UI Pages.
   b) Click New.
   c) Enter a Name, for example, redirector.
   d) Enter the following Adobe Jelly code into the HTML field.

   ```xml
   <j:jelly trim="true"
   xmlns:j="jelly:core" xmlns:g="glide" xmlns:j2="null"
   xmlns:g2="null">
   <script type="script/javascript">
   window.location.href="${sysparm_uri}";
   </script></j:jelly>
   ```

   The CMS now supports email links with following format:
   
   http://<path to instance>/<UI page>.do?uri=/<CMS suffix>/<record type>.do%26sys_id=<record ID>
   
   For example:
   
   http://<instance name>.service-now.com/redirector.do?sysparm_uri=/ess/incident.do%26sys_id=46e3e949a9fe19810069b824ba2c761a

   **Note:** If you are using SAML 2.0 update 1 for SSO, use the UI page saml_redirector instead of creating a new UI page. For example, an email link to a SAML 2.0 redirector page would use the URL format: http://<instance name>.service-now.com/saml_redirector.do?sysparm_uri=/ess/incident.do%26sys_id=46e3e949a9fe19810069b824ba2c761a.

Content Management templates

Templates are content pages that are reused to provide a consistent look and feel.

Templates are useful when creating CMS sites for the following reasons.

<table>
<thead>
<tr>
<th>Create new pages rapidly without risk by copying pages</th>
<th>Using a template to create new pages saves time because you do not have to keep repeating the same steps.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide a restore point for pages within the system</td>
<td>Have a working template available if something goes wrong in one of the blocks or in the theme CSS. It is often easier to start over from the template instead of trying to undo complex changes.</td>
</tr>
<tr>
<td>Provide a functional reference for editors on the site project</td>
<td>Having the template as a reference ensures that pages continue to conform to the style guide.</td>
</tr>
</tbody>
</table>

Page templates

Every page that is part of the site needs a template.

Critical page reference fields

When you build a new site, there are four page reference fields on the site record that are critical. Understanding these pages and how they are used helps you define page templates and site defaults.

- Home page: landing page for the site. A home page is mandatory.
• Search page: page that displays search results when a user searches from any page within the site. A search page is mandatory for your site to have a Search Results block.
• Login page: a standalone login page, which is useful to force authentication for the entire CMS site.
• Gauge target page: page used to display the drill-through content from a gauge. When the user clicks a gauge, the gauge target page opens showing the drill-through content for that gauge.

Figure 83: Critical page reference fields

**Detail pages**

Depending on the data or tables that you plan to use, you may need detail pages. These detail pages use one of the content types in the following list.

• Knowledge detail page: displays a full knowledge article detail (mandatory for a knowledge site).
• Incident page: detail page for an incident record.
• Catalog page: detail page for all items, content items, order guides, and record producers.

**Templates for creating sections**

There are two page templates you can use when creating sections:

• Parent page: keeps sections within large sites organized and sortable on the site list of pages. Parent pages are also used to create breadcrumbs dynamically.
• Detail page: differs from the parent page in that the content area displays a full article or detail instead of a selection of related content. Detail pages must have a Current Document block.

These pages are mandatory if you plan on accessing system data. For example, if you plan on showing the service catalog in your CMS, you need the following items.
• A service catalog content type that references the [sc_cat_item table].
• A detail page that provides the full view of the item.

New templates

If the base system sample site pages are not suitable, you can create a template from scratch. Create a page and then use it as a template. For more information, see Create a Content Page.

When you save a new template, include the word "template" in the page name.

Configure a master template

An easy way to create a master template is to copy the existing ESS sample site and customize it to suit your own needs. You can also configure a master template from scratch.

Role required: content_admin or admin

Follow these steps to create a single master page and generate all important components within the site.

1. Design a layout.
   Regardless of the interface, a site can be distilled into a few simple layouts.
2. Create a theme.
   The theme defines the structure of the layouts in CSS and the base styles, such as fonts and colors. For more information, see Design themes on page 446.
3. Build the common blocks.
   Pages are composed of content blocks. Most content blocks are reused on multiple pages. For the master template, build basic blocks such as a header, side navigation, and some basic content for the main content area of the page. More detailed content can be added later, but define content for reuse on many of the site pages here. For more information, see Content blocks on page 416.
4. Build a site entry page.
   Use the common content blocks you just created to design the first page that users see when they enter the site. For more information, see Create a content page on page 405.
5. Build a detail page.
   Design the detail pages to determine how pages such as knowledge articles, catalog items, and search results are displayed. You can build a detail page by copying the site entry page and adding additional content blocks. For more information, see Copy a page on page 409.
6. Assign the pages created to the new site.
   Create the site and apply the layout and theme to the site defaults. Then, navigate to the All Pages list and specify the master template site in the Site column for each of the master template pages. For more information, see Create a site on page 401.

Customize a copy of a page template

One good source for templates is the base system sample site. It is easy to copy pages and restyle them into new page templates to meet different business requirements.

The Employee Self-Service portal is provided as a working example and design template in the following procedure.

1. Navigate to Content Management Sites Employee Self-Service.
2. Select a page.
   For example, to copy the ESS sample site homepage, select Portal.
3. Click Copy.
4. Rename the page.
5. Right-click in the header and select Save.
7. Point your cursor to the content block to change and click the edit icon that appears on the right. For example, change the menus, alter the layout, or add a different logo.
8. Click Update.
9. Use the page in other sites you created by assigning pages to a site.

Content types

Content types provide site-specific control of how system data defined by templates is rendered.

In the site, one page displays a list of knowledge articles, and another page displays catalog items or incidents or a combination of the two. Different themes can be used for types of content and each theme can provide different user interaction. Content types define the pages that display content from a table. Each content type corresponds to a table.

Every type of document that the CMS displays has an associated content type. Changing the content type requires knowledge of Apache Jelly scripting. However, the common content types (such as service catalog or knowledge base) come in the base system. Content types can be associated with particular sites. This association allows different sites to use different detail pages for the same content type.

Content types define three features of associated documents.

- What does a link to one of these documents look like? For example, if a list of these documents is displayed on a page, how does each entry appear?
- What does a detailed view of one of these documents look like?
- What detail page is used to display the document? This decision is important and is often an area of confusion for new CMS users.

The document content type determines the page that a list of documents points to, the list itself does not determine the page. The content from a link is displayed in a detail content block on a page. The content type determines in which detail block on a page the document content is displayed.

For example, the list block Catalog Top 5 displays the top five items in the Service Catalog table [sc_cat_item]. Because the table is [sc_cat_item], the content type sc_cat_item controls how the Catalog Top 5 list is displayed. Clicking any item in the list displays the Service Catalog Detail page with the item displayed on it according to the detail template script. These content types are applied:

- in search results to link to the correct page.
- in the Current Document block to display the current record.
- in links on lists and other places that link to record types.

Several content types are available by default for tables such as Catalog Item [sc_cat_item], Gauge [sys_gauge], and Page [content_page].

Content type defaults that are set for CMS can be overridden for individual sites. Use the Content Types related list on the site record to customize content types.

Configure a content type

Users with the content_admin role can create a content type.

Role required: content_admin or admin

1. Navigate to Content Management Content Types.
2. Click New.
3. Complete the Content Type form.
### Table 77: Content Type form

<table>
<thead>
<tr>
<th>Field</th>
<th>Input Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Select the table whose content will be rendered in Content Management.</td>
</tr>
<tr>
<td>Content site</td>
<td>Select the site that will use this content type.</td>
</tr>
</tbody>
</table>
| Media type             | Enter one of the following media types to use with this content type.  
• doctype: UI15 desktop interface only  
• m: Smartphone interface only (not for CMS use)  
• tablet: Tablet interface only (not for CMS use) |
| Default detail page    | Select which page loads after a user clicks a link.                                                                                                                                                         |
| Gauge page             | Select which page is the drill-through target for any gauge. If you display a gauge on a CMS page, then clicking the links loads the page specified here.                                                        |
| Summary Template       | Write an XML script that determines how the list is displayed in the list block, if the link is displayed in a list block.                                                                                |
| Detail Template        | Write an XML script that determines how to display the associated information after a user clicks the link.                                                                                                  |

### CMS gauge support

Gauges are a graphical way to display information from an instance.

A gauge might, for example, show a bar chart breaking down all open incidents by category. Gauges are fully supported within the CMS system. This means:

1. **You can put a gauge on a CMS page**
2. **You can control what will happen when a user clicks on a cell within that gauge**

#### Put a gauge on a CMS page

You have control over the gauges on a CMS page.

1. Bring up the CMS page in edit mode.
2. Click Add Content.
3. Select the gauge you want to add.
4. Place the gauge on the page in the desired location.

#### Control what happens on a click

Since a CMS system uses multiple pages you have to tell the system which page to use to display drill through content:
In the normal (non CMS) system, when you click a bar in a bar chart or a wedge on a pie chart, you drill through and your current screen is replaced with a list of records meeting the chart's criteria. For example, if you have a gauge of Incidents by Category and you click the bar labeled Hardware you drill through to a list of all incidents with a category=hardware.

Within the CMS system, there is a similar drill through mechanism at work, but you must manually specify which page to display.

There are two different models of the drill through, use an in-place target frame to receive the content, or use another page to display the content.

**Using an In-Place Target**

An in-place target is a named iframe on the same CMS page as the gauge. When the gauge is clicked, the drill-through content appears within that iframe rather than changing out the CMS page. The gauge (and the rest of the page other than the target) remain in place and active.

**Using a Gauge Target Page**

A gauge target page is a separate CMS page that is used to display the drill-through content from a gauge. When a gauge is clicked, the current CMS page is replaced with the gauge target page and the drill-through content is rendered within that second page.

- **Gauge Target Page**
  
  To set a site default, select Gauge Target Page, on the site configuration page. This page is used as the drill-through target for any gauges in the system that do not have a more specific gauge page specified in their content type.

- **Gauge Page**
  
  To set a content-type specific page, you can specify a Gauge Page, on a content type page. Any gauges for this type of content then use that page for any drill through.

  **Note:** The gauge target on a particular content type overrides the default, site level, gauge target.

- **Gauge Target block**
  
  A gauge target page is a normal CMS page, with one special requirement. Somewhere on that page, there must be a Gauge Target block. This market block tells the system where to output the drill through data.

**View content types**

The following is an example of where you might use Content Types.

This example uses the out-of-box Employee Self-Service (ESS) site as an example.

Role required: content_admin or admin

Use any out-of-box instance of a CMS site.

   
   The Issue Status, or incident_status CMS page contains two content blocks: Common Answer and Current Issues. These content blocks both use Content Types to render results.
This block matches the Common Answers section of the Issue Status page. The Table field describes the Content Type associated with Common Answers.

4. Use the link to view existing Content Types.

5. Click the Content Type to view the XML that determines how the list and record are rendered in CMS. The Default Detail Page field indicates a CMS page that displays a record selected from a List of Content block.

6. Click the Information icon next to the Default Detail Page, to go to that page.

7. From the Default Detail Page, under Related Links, click Edit Page. The Detail Block contains a content type formatter. When editing or viewing the page, it is looking for a URL to be passed to determine the record to display, which is why it says "Detail record could not be located".

8. Click the pencil icon to edit and view the Detailed Content block. The Type drop down list has "Show the page's current document" selected, which indicates that the document_id must be passed to this block from the CMS pages, then it can display the record based on the content type listed in the document_id.

9. From the Common Answers block, on the Self Service page, select a record. The page opens with a URL similar to: https://<instance name>.service-now.com/ess/knowledge.do?sysparm_document_key=kb_knowledge,02255450d731310013ab49547e61038e

   The table sysparm_document_key=kb_knowledge and sys_id 02255450d731310013ab49547e61038e determine the record. The associated content type, kb_knowledge, renders the content on the Default Detail Page, Portal - Knowledge Detail / url_suffix=knowledge.

Content blocks

A block is a defined piece of content within the system that can be reused. A content page is constructed by arranging customized blocks of content on a page. Content blocks are an important part of a CMS site. Existing content such as reports, gauges, and record lists are automatically available as content blocks and more can be created within the CMS.

After defining content blocks, use them on any content page by adding them to drop zones. For more information, see Add content to a page on page 407.

Create content blocks after sites and pages have been designed.

Configure a content block

To configure a content block, define it in the appropriate form.

Role required: content_admin or admin

1. Perform one of the following actions to create a content block.

   • Navigate to Content Management Blocks [Block type] New. The form for creating the selected block type opens.
   • Navigate to Content Management Blocks All and select the type of content to create from the list.
   • Edit a content page and add a stub block of the desired content block type. Click the link in the stub block.

2. Complete the content block form and save it.

3. Add the content block to any content page.
View CMS block tags

A CMS block tag is used for advanced block creation and site flexibility.

Role required: content_admin or admin

It is constructed as \texttt{<g:content\_block> \{Jelly\_Tags|Jelly\}]} and can be used in either of the following ways.

- Blocks: to display a block inside a block.
- Layouts: to display a block inside a layout.

The tag appears in the format, \texttt{<g:content\_block type=\"<type>\" id=\"<sys\_id>\"/>}.

An example of the block tag is included in the ESS Portal sample site.

1. Navigate to Content Management Design Frames.
2. Click cms\_admin\_home\_frame.
3. View the code.

```html
<style>
    DIV.cms\_administration\_home {
        background: url(gray\_${current\_page\_.getURL\_Suffix}\.pngx) no-repeat right top;
    }
</style>

<div class=\"cms\_administration\_home\">
    ${body}
    <br/>
    <!-- Would you like to pivot off of parent page instead? try this snippet
    <j:if
        test=\"${current\_page\_.getParent\_Page()\_.getURL\_Suffix}==\"administration\"\">\n        <g:content\_block type=\"content\_block\_menu"
            id=\"7afc342def002000914304167b2256ac\"/>
    </j:if>
    The defaults use the page URL suffix to define sub menus -->
    <j:if test=\"${current\_page\_.getURL\_Suffix}==\"administration\"\">\n        <g:content\_block type=\"content\_block\_menu"
            id=\"7afc342def002000914304167b2256ac\"/>
    </j:if>
    <j:if test=\"${current\_page\_.getURL\_Suffix}==\"community\_inspired\"\">\n        <g:requires name=\"ess\_portal\_globals.jsdbx\" />
        <g:content\_block type=\"content\_block\_menu"
            id=\"ccd4b8c7efb70000914304167b22566e\"/>
    </j:if>
    <br/>
</div>
```

4. To see what the page looks like, navigate to the ESS Portal administration page. For example, http://instance\_name.service\-now.com/ess/administration\_do.

Types of content blocks

Content blocks, which make up content pages, are reusable pieces of content defined within the system.

Each content block can be used for a different type of content.
Configure a header block
A header block is a visual element placed at the top of pages. It provides a place for branding and other important site-wide functionality.

Role required: content_admin or admin

Some of the options that are available in headers include, global search, text size toggle, menus for navigational purposes, and the user name with logout link.

1. Navigate to Content Management Blocks Headers.
2. Click New.
3. Complete the form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Type a unique name for the header block.</td>
</tr>
<tr>
<td>Background</td>
<td>Select a background for the header logo and menus.</td>
</tr>
<tr>
<td></td>
<td>• None - No background is rendered.</td>
</tr>
<tr>
<td></td>
<td>• Gradient/Image - Specify an image or gradient image to serve as the background.</td>
</tr>
<tr>
<td></td>
<td>• Colored Bars - Specify colors for three different sections of the header, top, middle, and bottom.</td>
</tr>
<tr>
<td>Image</td>
<td>If Background is Gradient/Image, upload an image for the header block background. For gradients, upload a gradient image.</td>
</tr>
<tr>
<td>Top bar color</td>
<td>If Background is Colored Bars, enter a CSS color or color name to use as the background for the top menu.</td>
</tr>
<tr>
<td>Middle bar color</td>
<td>If Background is Colored Bars, enter a CSS color or color name to use as the background for the logo and text.</td>
</tr>
<tr>
<td>Bottom bar color</td>
<td>If Background is Colored Bars, enter a CSS color or color name to use as the background for the bottom menu.</td>
</tr>
<tr>
<td>Logo</td>
<td>Select a logo image. The image is also a link to the main page.</td>
</tr>
<tr>
<td>Active</td>
<td>Select this check box to make the block available for use.</td>
</tr>
<tr>
<td>Text</td>
<td>Type the text to display beside the logo.</td>
</tr>
<tr>
<td>Conditional</td>
<td>Select the check box and type any scripted conditions to apply in the Condition script field that appears.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Category</td>
<td>Select a category to provide organization for the header block. The category also determines the detail page in which header block links open. Detail pages often display information in different ways.</td>
</tr>
<tr>
<td>Top Menu</td>
<td>Select a navigational menu block to use as a menu above the logo.</td>
</tr>
<tr>
<td>Bottom Menu</td>
<td>Select a navigational menu block to use as a menu below the logo.</td>
</tr>
<tr>
<td>Height</td>
<td>Specify the height for the header.</td>
</tr>
<tr>
<td>Search</td>
<td>Select this check box to add a search element in the header.</td>
</tr>
<tr>
<td>Font sizer</td>
<td>Select this check box to include text sizing controls in the header.</td>
</tr>
<tr>
<td>Login</td>
<td>Select this check box to include a login link in the header. If the user is logged in, this element displays the user name and a logout link. If you specify a login page on the site record, it is important to include a login link so users can enter their username and password.</td>
</tr>
<tr>
<td>Chat Queue</td>
<td>Select the chat queue that users access by clicking the Help Desk Chat button in the header. Clear the field to remove the button. This field appears only if the Chat plugin is active.</td>
</tr>
</tbody>
</table>

*Create a navigation menu block*

Navigation menu blocks enable you to create a menu of links to different content pages.

**Role required:** content_admin or admin

The following three objects define navigation menus.

- **Menu block:** The menu block defines the entire menu block and how it displays.
- **Menu section:** The menu sections define groups of links displayed within the block.
- **Menu item:** The menu items define the links within each menu section.

1. **Navigate to** Content Management Navigation Menus.
2. **Click New.**
   - A gallery of available navigation menu blocks displays.
Choose a Menu System from the Options Below

3. Select the desired menu block style.
4. Complete the Navigation Menu form to define the block.

**Table 79: Navigation Menu form**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a unique name for the block.</td>
</tr>
<tr>
<td>Type</td>
<td>Select the type of navigation menu, which determines how the links are displayed.</td>
</tr>
<tr>
<td>Frame</td>
<td>Select a border style for the navigation menu block.</td>
</tr>
<tr>
<td>Conditional</td>
<td>Select this check box to enable the use of scripted conditions. If selected, the Condition and Logged On fields appear.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Logged on</td>
<td>Select this check box to display the navigation menu block only if the user is logged on. This field appears only if Conditional is selected.</td>
</tr>
<tr>
<td>Condition</td>
<td>Enter a script to define the conditions for the navigation menu block. This field appears only if Conditional is selected.</td>
</tr>
<tr>
<td>Active</td>
<td>Select this check box to make the block available for use.</td>
</tr>
<tr>
<td>Category</td>
<td>Select a category to provide organization for the navigation menu block. The category also determines the detail page in which menu links open.</td>
</tr>
</tbody>
</table>

Configure menu sections

Menu sections define groups of links displayed within the navigation menu block.

Role required: content_admin or admin

1. Navigate to Content Management Blocks Navigation Menus and select a block.
2. In the Menu Sections related list, click New.
3. Complete the Menu Section form.

Table 80: Menu Section form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a unique name for the menu section.</td>
</tr>
<tr>
<td>Content block menu</td>
<td>Select the navigation menu on which this menu section appears.</td>
</tr>
<tr>
<td>Redirect to</td>
<td>Select what appears when a user clicks the menu section name and icon.</td>
</tr>
<tr>
<td>URL</td>
<td>Click the lock icon to open the edit field, then enter the URL to display when a user clicks the menu section title and icon. This field is available only if Redirect To is set to The specified URL.</td>
</tr>
<tr>
<td>Detail page</td>
<td>Select the content page to open when a user clicks the menu section title or icon. This field is available only if Redirect To is set to A content page.</td>
</tr>
<tr>
<td>Left image DB</td>
<td>Select the image database where your site images are stored.</td>
</tr>
<tr>
<td>Right image DB</td>
<td></td>
</tr>
<tr>
<td>Left image</td>
<td>Select icons to appear on the left and on the right of the name.</td>
</tr>
<tr>
<td>Right image</td>
<td></td>
</tr>
</tbody>
</table>
Configure menu items

Menu items are the links that appear within each menu section.

Role required: content_admin or admin

Not all navigation menu sections require menu items. Use menu items to link users to other pages or additional information. These steps use the ESS sample portal site as an example.

1. Navigate to Content Management Blocks Navigation Menus and select a navigation menu. For example, select the Documentation Menu.
2. From the Menu Sections related list, select a menu section. For example, select Getting Started.
3. From the Menu Items related list, click New.
4. Complete the form.

### Table 81: Menu Item form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Type a unique name for the menu item.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Menu section</td>
<td>Select the menu section in which this item appears.</td>
</tr>
<tr>
<td>Redirect to</td>
<td>Select what appears when the menu item name and icon are clicked.</td>
</tr>
<tr>
<td>URL</td>
<td>Click the lock icon to open the edit field, then enter the URL to open when the menu item title and icon are clicked. This field is available only if Redirect to is set to The specified URL.</td>
</tr>
<tr>
<td>Detail page</td>
<td>Select the content page to open when the name or icon is clicked. This field is available only if Redirect To is set to A content page.</td>
</tr>
<tr>
<td>Image</td>
<td>Select an icon to appear with the name.</td>
</tr>
<tr>
<td>Active</td>
<td>Select this check box to make the menu item available for use.</td>
</tr>
<tr>
<td>Order</td>
<td>Enter a number to indicate where this item appears on the menu relative to other menu items.</td>
</tr>
<tr>
<td>Logged on</td>
<td>Select this check box to display the menu item only if the user is logged on.</td>
</tr>
<tr>
<td>Roles</td>
<td>Click the lock to open a list, then select the roles that can access this menu item to restrict access by role.</td>
</tr>
<tr>
<td>Category</td>
<td>Select the category in which the menu item belongs.</td>
</tr>
<tr>
<td>Open in</td>
<td>Select the behavior of clicked links.</td>
</tr>
<tr>
<td>iFrame</td>
<td>Type the name of the iFrame where the link opens when a user clicks the menu item name and icon. Make sure that there is an iFrame on the page. This field is available only if Open In is set to Named iFrame.</td>
</tr>
</tbody>
</table>

5. Click Submit.

Menu types
By changing the Type field on the navigation menu block, you can format the same menu in different ways.
<table>
<thead>
<tr>
<th>Type</th>
<th>Image</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Super Menu for Headers</td>
<td>![Super Menu Image]</td>
<td>The super menu is a hybrid between the drop-down menu and the tabbed system. The user can use a super menu to create a menu from any number of menus.</td>
</tr>
<tr>
<td>Drop-Down Menu for Headers</td>
<td>![Drop-Down Menu Image]</td>
<td>The drop-down menu renders the menu sections as drop-down list. Use the mouse to point to the menu name and view the menu items.</td>
</tr>
<tr>
<td>Tab Menu for Headers</td>
<td>![Tab Menu Image]</td>
<td>The tab menu renders the menu sections as tabs. Use the mouse to click the tab and view the menu items.</td>
</tr>
<tr>
<td>Type</td>
<td>Image</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Horizontal Blocks</td>
<td><img src="image.png" alt="Image" /></td>
<td>The horizontal blocks menu renders the menu sections as block headings with menu items as links within the blocks. The blocks are arranged horizontally.</td>
</tr>
<tr>
<td>Tab Content Block</td>
<td><img src="image.png" alt="Image" /></td>
<td>The tab content block (horizontal) menu renders the menu sections as tabs with menu items as links within the block.</td>
</tr>
<tr>
<td>Vertical List</td>
<td><img src="image.png" alt="Image" /></td>
<td>The vertical list menu renders the menu sections as headings with menu items as links below them.</td>
</tr>
</tbody>
</table>
Menu style customization

You can customize menu styles in the style sheets your site uses.

Navigate to Content Management Design Style Sheets to customize style sheets.

**Supplementary page navigation menu example code**

In the following example, look at the CSS class selectors and rules. Also, review how the block containers (div.cms_menu_section_blocks) are defined based on the outer container (TD.layout_content_submenu_column). The outer container is actually a part of the site layout.

This concept is clearer if you compare the styles to the styles used in the super menu further down in the example. This example shows that there is no need to make a completely new menu system. You can use CSS to change the look and feel of existing menus.

```html
/ *********************************************************************************************************************************************************/
/* SUB MENU VARIATIONS FOR HORIZONTAL MENUS - Section Blocks Menu */
/**/(cms_menu_section_blocks UI Macro)
 *********************************************************************************************************************************************************/

TD.layout_content_submenu_column DIV.cms_menu_section_blocks {
    width: 156px;
    height: auto;
    float: left;
    position: relative;
    border-style: solid;
    margin: 0px 0px 0px 0px;
    border: 0px solid #e0e0e0;
    padding: 0px;
    background: none;
    padding: 24px 12px 0px 12px;
}

TD.layout_content_submenu_column DIV.sub_menu_section {
    width: 156px;
    height: 20px;
    float: left;
    border-style: solid;
    border: 0px solid #e0e0e0;
    padding: 0px;
    background: none;
}
Super menu sections example code

The following menu is a simple float grid. The defaults are written first. Then, below the "SUPER MENU VARIATIONS..." comment, the defaults are overwritten by adding a containing div with a unique class.

In the code that renders the header for the base system, the bottom menu resides in a table cell with the class of cms_header_bottom_menu (refer to the TD.cms_header_bottom_menu CSS selector).

/                                                                                                                 *
SUB MENU VARIATIONS FOR HORIZONTAL MENUS - Section Blocks Menu
(cms_menu_section_blocks UI Macro)

TD.layout_content_submenu_column DIV.cms_menu_section_blocks {
    width: 156px;
    height: auto;
    float: left;
    position: relative;
    border-style: solid;
    margin: 0px 0px 0px 0px;
    border: 0px solid #e0e0e0;
    padding: 0px;
    background: none;
    padding: 24px 12px 0px 12px;
}

TD.layout_content_submenu_column DIV.sub_menu_section {
    width: 156px;
4.2 2. Super Menu Sections Example Code

This menu is essentially a simple float grid. The defaults are written first. Then, below the "SUPER MENU VARIATIONS..." comment, the defaults are overwritten by adding a containing div with a unique class. In the code that renders the header for the base system, the bottom menu resides in a table cell with the class of "cms_header_bottom_menu" (note the TD.cms_header_bottom_menu CSS selector).

/*
  *******************************************************************************************
  Section Blocks Menu (cms_menu_section_blocks UI Macro)
  *******************************************************************************************
*/
div.cms_menu_section_blocks {
  width: 260px;
  height: 260px;
  float: left;
  border-style: solid;
  margin: 0px 0px 12px 12px;
  border: 1px solid #e0e0e0;
  padding: 10px;
  background: url(blue/portal_horizontal_bkg.png) repeat-x center bottom;
}
SUPER MENU VARIATIONS FOR HORIZONTAL MENUS - Section Blocks Menu
(cms_menu_section_blocks UI Macro)

TD.cms_header_bottom_menu .cms_menu_super_menu_bar { /*style the super menu drop down bar */
  z-index: 199;
  float: left;
  background: none;
  margin-left: 44px;
}

TD.cms_header_bottom_menu div.cms_menu_section_blocks {
  width: 200px;
  float: left;
  border: 0px;
  margin: 0px 0px 12px 0px;
  padding: 0px;
  background: none;
}

TD.cms_header_bottom_menu p.cms_menu_separator {
  border-top:0px dotted #ccc;
  margin-top: 0px;
  margin-bottom: 0px;
}

TD.cms_header_bottom_menu .cms_menu_super_menu_bar_item { /*style an item on the super menu drop down bar*/
  z-index: 200;
  float: left;
  padding-left: 12px;
  padding-right: 12px;
  padding-bottom: 8px;
  padding-top: 4px;
  cursor: pointer;
  cursor: hand;
  font-weight: bold;
  color: #000;
  border-left: 1px solid #FFF;

Example menu items and content links

The method for choosing a link target (current window, iFrame, or new window) and referencing the item linked (page, attachment, or URL) are similar. Review examples of how to link within these elements.

- A content page reference helps you select the desired page. For example, the value home.do links to the site homepage.
- An attachment reference allows you to reference a single file attached to the menu item or section record. If there is more than one attachment, only the first attachment is referenced. The link is then generated automatically and displays a Browser File Save prompt.
- The specified URL reference allows you to link to a full URL string in your instance or from another system. For example, com.glideapp.servicecatalog_cat_item_view.do?sysparm_id=66c313e7c0a8016b008ebe1a8e3d97f5&sysparm_nameofstack=b654d15bef921000914304167b225638 links to the Ask a Question record producer. Use this reference to link to a page in an existing intranet system.
Menu items can be seen as featured links from each section. There are many choices in URL definitions and link options. Links within the ESS Portal open content pages within the site. In turn, each page has an iFrame or set of blocks that houses the corresponding data. This method is useful for rapid prototyping, but consider where to create dynamic detail pages and use the available linking options.

**Figure 85: Menu item**

Menu items are similar to content links except they are called by the list block, not as part of a navigation menu block. Menu items and content links function the same as far as how they are defined and the options available for linking to items. Content links are meant to be called through a list block that calls the Content Link [content_link] table. Content links do not have the Logged in field or the Roles option used to control the UI experience for various roles.
Figure 86: Content link

View menu and list examples

Menu sections define groups of links and how the links behave.

Role required: content_admin or admin

For example, link behavior determines which page opens when the link is clicked and how it opens, such as in a new page or a new frame. Use the following procedure to view a sample menu section.

2. Click Portal - Block Menu.
3. In Menu Sections related list, click Order Things.
4. Click the reference icon next to Detail Page to open the page.
5. In Related Links, click Edit Page.

By default, the link goes to the Order Things page with the Portal - Order Splash Menu (Vertical Block Menu) in the page content area.

In most default CMS menus, the menu section has the menu title with secondary text, a separation line, and the links you define as menu items. Although the design is versatile and flows well between pages, there could be questions about linking and scalability to large catalogs. This practice may only be useful for a small catalog with limited items.

6. To view an example of dynamic content, follow these steps to look at the request catalog list/grid view on the ESS Portal.
   a) Add /ess/manage.do to your instance URL.
      For example, https://<instance name>.service-now.com/ess/manage.do.
   b) In the Code Example Demos section, click Request Catalog List / Grid View.
   c) Browse the catalog items.
Configure dynamic blocks
Use dynamic blocks to use scripting or to pull information from the system. Dynamic blocks are where most of your content resides.

Role required: content_admin or admin

A good use of dynamic blocks is job postings. Store the postings in knowledge articles and display the postings with a dynamic block.

Several dynamic blocks are predefined, including the following items.

- New Content: Each of the new content blocks allows for creating blocks while editing content pages.
- Clean Login: The default login page requesting user name and password, which includes a "Remember Me" check box. After the user logs in, this block triggers login rules.
- Login: An area that allows a logged out user to log in and a logged in user to log out. This block is especially useful on publicly available content pages.
- Search: The global text search field. Currently, global text search is the only form of search that can be included in a content page.
- Search Results: An area for displaying global text search results.

For information about Apache Jelly, see Jelly tags.

1. Navigate to Content Management Dynamic.
2. Click New.
3. Complete the Dynamic Content form.

Table 83: Dynamic Content form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Type a unique name for the dynamic content block.</td>
</tr>
<tr>
<td>Category</td>
<td>Select a category to provide organization for the dynamic block. The category also determines the detail page in which dynamic block links open.</td>
</tr>
<tr>
<td>Frame</td>
<td>Select a border styling for the dynamic block. For more information, see Format a frame on page 447.</td>
</tr>
<tr>
<td>Active</td>
<td>Select this check box to make the block available for use.</td>
</tr>
<tr>
<td>Conditional</td>
<td>Enter any scripted conditions to be applied. If selected, adds a Condition script field to the form.</td>
</tr>
<tr>
<td>Two phase</td>
<td>Select this check box to allow two phase Jelly tags.</td>
</tr>
<tr>
<td>Dynamic content</td>
<td>Enter the XML script field that determines the behavior of the dynamic block.</td>
</tr>
</tbody>
</table>

Catalog cart block
The catalog cart block is a dynamic block provided in the base system.
This block provides the same cart that is available within the service catalog. If the site definition has the Use external cart option selected, include this block in the site so users can interact with their catalog cart.

Catalog cart block is available when the glide.sc.use_cart_layouts property is set to false.

*Customize the list block*

List blocks are content blocks that dynamically generate a list of links to records within the instance. When a user clicks a link in a list block, the associated information is displayed in a detail page determined by its content type.

**Role required:** content_admin or admin

Make the list using a simple query on any table or by scripting a more advanced query. Lists are powerful and flexible. Here are some places that allow you to have complete control over the list display.

**Table 84: List control**

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frames</td>
<td>Frames provide a method to create decorative containers for content blocks and other elements within the site. When frames are used with the Type field, the designer has complete control over list placement.</td>
</tr>
<tr>
<td>List Type</td>
<td>The List Definitions module defines the type of lists available for content pages. On the List Block form, select a list definition in the Type field.</td>
</tr>
<tr>
<td>List Filtering</td>
<td>Provides every field in the referenced table for more granular results.</td>
</tr>
<tr>
<td>Max Entries</td>
<td>Limits the results from a table to fit the design of the block.</td>
</tr>
<tr>
<td>Order and Order Direction</td>
<td>Allows sorting by any field in the referenced table, in either ascending or descending order.</td>
</tr>
</tbody>
</table>

You can also use list blocks to create a list of links to information outside your instance. Create the external links as records on the Content Link [content_link] table, and then follow the steps in this procedure.

1. Navigate to Content Management Lists.
2. Click New.
3. Complete form.

**Table 85: List Block fields**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a unique name for the list content block. It is used to identify the record in the instance and is not displayed on the content page. Use the Title field for that purpose.</td>
</tr>
<tr>
<td>Category</td>
<td>Select a category to provide organization for the list content block.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Type</td>
<td>Select a list definition UI macro to format the list of links. For more information, see <em>Configure list definitions</em> on page 435.</td>
</tr>
<tr>
<td>Frame</td>
<td>Select a border style for the list block. For more information, see <em>Create a frame UI macro</em> on page 448.</td>
</tr>
<tr>
<td>Advanced</td>
<td>Select this check box to enable generating a list from a script, rather than from a simple filtered query.</td>
</tr>
<tr>
<td>Query</td>
<td>Filters the results using a condition builder.</td>
</tr>
<tr>
<td>Active</td>
<td>Select this check box to make the block available for use.</td>
</tr>
<tr>
<td>Title</td>
<td>Enter the name to display at the top of the list block when it appears in a content page.</td>
</tr>
<tr>
<td>Maximum entries</td>
<td>Set the maximum number of entries to display in this list block.</td>
</tr>
</tbody>
</table>
| Table         | Select a table to query for the list items. The table determines which detail page displays when a user clicks a link in the list block. For more information, see *Configure a content type* on page 413.  
  
  **Note:** The list shows only tables and database views that are in the same scope as the list block. |
| Conditional   | Select this check box to enable the use of scripted conditions. If selected, a Condition script field appears. Other fields that appear include the Logged On and Omit if empty check boxes. |

4. Click Submit.

Configure list definitions

List definitions, similar to content management frames, are decorative containers that control the look and feel of lists.

Role required: content_admin or admin

Specifically, list definitions are UI macros that use Adobe Jelly script to define how a list is rendered inside a list block. Site design often requires multiple list styles within the layout. Lists are often the primary form of navigation within a site, so it is important to have control over their formatting.

Configuring list definitions requires a knowledge of Adobe Jelly.

1. Navigate to Content Management Configuration List Definitions.
2. Click New.
3. Complete the List Definition form.

Configure a static HTML block
Use static blocks for text that does not change. For example, use a static block for a site footer with only the company or organization name. A static HTML block allows any HTML code to be run within a page.

Role required: content_admin or admin

Anyone who edits their own HTML, Jelly, or Javascript may find the HTML editor in the static block limited. The HTML editor can also add tags or formats that advanced coders find unnecessary. For more advanced options, use dynamic blocks.

1. Navigate to Content Management Blocks Static HTML.
2. Click New.
3. Complete the Static Content form.

Table 86: Static content form

<table>
<thead>
<tr>
<th>Field</th>
<th>Input value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Type a unique name for the static HTML content block.</td>
</tr>
<tr>
<td>Category</td>
<td>Select a category to provide organization for the static HTML block. The category also determines the detail page in which static HTML block links open. Detail pages often display information in different ways.</td>
</tr>
<tr>
<td>Frame</td>
<td>Select a border styling for the static HTML block. For more information, see Format a frame on page 447.</td>
</tr>
<tr>
<td>Active</td>
<td>Select this check box to make the block available for use.</td>
</tr>
<tr>
<td>Conditional</td>
<td>Enter any scripted conditions to be applied. If selected, adds a Condition script field and Logged on check box to the form.</td>
</tr>
<tr>
<td>Static Content</td>
<td>Enter HTML code that determines the behavior of the static HTML block.</td>
</tr>
</tbody>
</table>

4. Click Submit.

Format an image as a static HTML block
An easy way to add an image to a CMS page is to use a static HTML block. After the block is created, you can reuse it throughout the site.

Role required: content_admin or admin

1. Navigate to Content Management Design Images.
2. Click New.
3. Select a Category to help organize the images.
4. Type the file name of the image, including the extension (such as .png).
5. Upload the file by selecting Click to add and browsing for the image.
6. Click OK.
7. Click Update.
9. Paste the following code into the HTML block, substituting the image name as uploaded in the previous step.
   The "x" at the end of the filename is required for image caching.
   
   `<img src="<image_name>.gifx"/>
   
   Now the image is a static HTML block and you can add it to any content page. Use standard HTML code to alter the image in the content block.

Configure Flash movie blocks
Use a Flash movie block to embed any Flash movie (.swf file) as an attachment or by referencing a URL in a content page.

Role required: content_admin or admin

To add streaming video or Flash video (.flv), for example, to a knowledge article, see *Embed videos in HTML fields*.

1. Navigate to Content Management Specialty Content Flash Movies.
2. Click New.
3. Complete the Flash Movie form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Input value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Type a unique name for the Flash movie block.</td>
</tr>
<tr>
<td>Source</td>
<td>Specify where the Flash movie is found.</td>
</tr>
<tr>
<td></td>
<td>• Attachment: If this choice is selected, upload the Flash movie to this record.</td>
</tr>
<tr>
<td></td>
<td>• Link to External Object: If this choice is selected, a URL field appears. Specify the Flash movie URL and ensure that the Flash movie is publicly accessible.</td>
</tr>
<tr>
<td>Height</td>
<td>Enter the height of the Flash movie in pixels.</td>
</tr>
<tr>
<td>Width</td>
<td>Enter the width of the Flash movie in pixels.</td>
</tr>
</tbody>
</table>

4. Click Submit.

Configure content links
Content links are the predecessors to navigation menus. You can use content links to create navigational links to information outside of your instance.

Role required: content_admin or admin

After the content link is configured, it must be defined in a list block. List blocks use content links to reference information outside of your CMS.

1. Navigate to Content Management Specialty Content Content Links.
2. Click New.
3. Complete the Content Link form.
Table 88: Content Link form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Type a unique name for the content link</td>
</tr>
<tr>
<td>Redirect to</td>
<td>Select the location of the external link</td>
</tr>
<tr>
<td>Category</td>
<td>Select a category to provide organization for the list content block.</td>
</tr>
<tr>
<td>URL</td>
<td>Click the lock icon to open the edit field, then enter the site URL to open when the link is clicked. This field is available only if Redirect to is set to The specified URL.</td>
</tr>
<tr>
<td>Open in</td>
<td>Select the behavior of the clicked link.</td>
</tr>
<tr>
<td>Detail page</td>
<td>Select the page where the link opens when it is clicked. This field is available only if Redirect to is set to A content page.</td>
</tr>
<tr>
<td>iFrame</td>
<td>Enter the name of the iFrame where the link opens when it is clicked. Make sure that there is an iFrame on the page where the link opens. This field is available only if Open In is set to Named iFrame.</td>
</tr>
</tbody>
</table>

4. Click Submit.
5. From Content Management Blocks Lists, create a list block that references the content links by selecting Content Link in the table field.
6. Create a query to determine which external links display on the page. For example, the query Category is Search displays any external links that have a category defined as Search.
7. Click Update.

Configure iFrames
An iFrame embeds a URL on a page within a frame. It can embed external pages or render ServiceNow content.

Note: Do not add any type of report, such as a calendar, to iFrames. For more information on adding a report directly onto a page without using iFrames, see Embedding reports in Jelly.

Note: The ServiceNow login portlet is the only content supported within an iFrame HTML element. To deliver ServiceNow content from a web page, see Service Portal on page 2610 instead.

1. Navigate to Content Management Specialty Content iFrames.
2. Click New.
3. Complete the iFrame form fields.
### Table 89: iFrame form fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Input value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Type a unique name for the iFrame block.</td>
</tr>
<tr>
<td>Frame name</td>
<td>Type a name for the frame on the page. When you use iFrames to present ServiceNow content such as forms or lists, the frame name must be gsft_main. This name allows links within the iFrame to open within the iFrame.</td>
</tr>
<tr>
<td>URL</td>
<td>Enter the URL to display in the iFrame. If you use the iFrame to display ServiceNow content, start with the page name and do not include the base instance part of the URL. For example, to show the list of requested items, the URL is: <code>sc_req_item_list.do</code>. Queries can be applied to the URL. For instance, to display a list of open requested items, the URL is: <code>sc_req_item_list.do?sysparm_query=active=true</code>. For more information, see <a href="#">Navigate to a record or module using a URL</a>.</td>
</tr>
<tr>
<td>Sizing</td>
<td>Select an option for iFrame block size.</td>
</tr>
</tbody>
</table>

**Note:** Some browsers suppress iFrames because they use an X-Frame-Options header value of SAMEORIGIN. The X–Frame-Options header was introduced in Internet Explorer 8 RC1, to help detect and prevent frame-based redressing. The SAMEORIGIN value causes the browser to render a blank page instead of the target page of the `<frame>` or `<iframe>` when the frame target is not on the same origin as the page itself. Support for this header has been implemented in Safari 4.0, Chrome 4.1.249.1042, and Firefox 3.6.9 and above.

---

**Integrate Live Feed with CMS**

You can provide access to Live Feed from pages built in the Content Management System (CMS). For example, allow an end user to access your company feed via the ESS portal.

The ESS Portal template includes the Portal - Live page and Live Feed dynamic block (requires the Live Feed plugin). To provide access to Live Feed from CMS pages, add the Live Feed dynamic block to a CMS page or include the Portal - Live page in a site.

1. Navigate to Content Management Specialty Content iFrames.
2. Click New.
3. Complete the iFrame block form with the following values.

Table 90: iFrame values

<table>
<thead>
<tr>
<th>Field</th>
<th>Input value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Type a unique name: Live Frame</td>
</tr>
<tr>
<td>Frame name</td>
<td>Type a frame name: live_frame</td>
</tr>
<tr>
<td>URL</td>
<td>Enter <a href="https://instance">https://instance</a> name/live_feed.do?sysparm_doctype=true. Replace instance name with your instance URL, for example, &lt;myinstance&gt;.service-now.com.</td>
</tr>
<tr>
<td>Sizing</td>
<td>Select Fixed Size and enter height and width pixel dimensions according to the page on which you plan to display the feed. For example, enter a width of 1024 and height of 768.</td>
</tr>
</tbody>
</table>

4. Click Submit.
5. Complete the steps in *Add the block to a page*.

iFrame methods

The following examples show how system records are pulled into an iFrame that is placed on a content page.

For system lists or forms, use the frame name gsft_main so that links work properly.

- **Order Hardware** is an example of linking to a catalog category.
  - URL: com.glideapp.servicecatalog_category_view.do?
    - sysparm_parent=d258b953c611227a0146101fb1be7c31&sysparm_view=
  - Frame name: gsft_main

- **My Approvals List** is an example of linking to a list with a view filter and a JavaScript that reference the authenticated user.
  - URL: sysapproval_approver_list.do?
    - sysparm_query=approver=javascript:getMyApprovals()&sysparm_view=ess
  - Frame name: gsft_main

- **Service Catalog Home Page (system)** references the system catalog page within the Service Catalog application. If you are satisfied with the way the catalog looks, this method is an easy way to bring the page into a CMS design.
  - URL: catalog_home.do?sysparm_view=catalog_default
  - Frame name: gsft_main

- **Problem Management Overview** references a homepage. ../ makes the URL string relative to system homepages. Without it, the URL string resolves to the default CMS homepage reference in the site.
  - URL: ../home.do?sysparm_view=problem_overview
  - Frame name: gsft_main
Configure a detailed content block

A detailed content block displays the content of an existing document, such as an incident, knowledge article, or service management request. The document type determines the page that a list of documents points to.

Role required: content_admin or admin

The block works with content types in the Default detail page field. For more information, see Configure a content type on page 413.

If you plan to use a script to find a document, configure the form to add the Script field if it is not displayed.

1. Navigate to Content Management Configuration Page Detail Settings.
2. Click New.
3. Complete the Detailed Content form.

Table 91: Detailed Content form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Type a unique name for the Detailed Content block.</td>
</tr>
<tr>
<td>Category</td>
<td>Select a category to provide organization for the detailed content block. If the block Type is Show the page's current document, the category displays content from any link of the same type.</td>
</tr>
<tr>
<td>Frame</td>
<td>Select a border styling for the detailed content block. For more information, see Format a frame on page 447.</td>
</tr>
<tr>
<td>Model Document</td>
<td>Select the document to display by default.</td>
</tr>
<tr>
<td>Active</td>
<td>Select this check box to make the block available for use.</td>
</tr>
<tr>
<td>Type</td>
<td>Select the behavior for the block.</td>
</tr>
<tr>
<td></td>
<td>• Show a Specific Document: Displays the Model Document.</td>
</tr>
<tr>
<td></td>
<td>• Show the page's current document: Displays the currently selected document.</td>
</tr>
<tr>
<td></td>
<td>• Use a script to find a document: Uses the Script field to select a particular document.</td>
</tr>
<tr>
<td>Conditional</td>
<td>Select the check box and enter any scripted conditions to be applied. Selecting this check box adds a Condition script field and Logged on check box to the form.</td>
</tr>
<tr>
<td>Script</td>
<td>Enter a script to find an appropriate document if the Type is set to Use a script to find a document. Set the Return to the GlideRecord of the desired document.</td>
</tr>
</tbody>
</table>
4. Click Submit.

Content Management and the Apache Jelly engine

Apache Jelly is a Java-based and XML-based scripting and processing engine for turning XML into executable code.

The Apache Jelly engine closely resembles XML and should be comfortable for developers familiar with JavaScript, XML, XHTTP, or HTML. In the ServiceNow instance, the Apache Jelly engine renders items such as forms, lists, and UI Pages. Apache Jelly code renders well within a dynamic content block, but can have issues when used in static blocks. You can use Jelly tags, calls, and statements, but HTML acts just like XHTML.

```xml
<?xml version= "1.0" encoding= "utf-8" ?>
<j:jelly trim = "false" xmlns:j = "jelly:core" xmlns:g = "glide" xmlns:j2 = "null" xmlns:g2 = "null" >

<j:if test = "${current_page.getName()}'==Solutions'" >
<h1 class = "page_name" > <b> <a href = "solutions.do?" title = "${gs.getMessage('Solutions')}">${gs.getMessage('Solutions')}</a> </b> </h1>
<p class = "page_description" >
${current_page.getDescription()}
</p> \br /</j:if>

<j:if test = "${current_page.getName()}'==IT 3.0'" >
<h1 class = "page_name" > <b> <a href = "solutions.do?" title = "${gs.getMessage('Solutions')}">${gs.getMessage('Solutions')}</a> | ${current_page.getName()}</b>
</h1><p class = "page_description" >
${current_page.getDescription()}
</p> \br /</j:if>
</j:jelly>

Ensure that all tags are closed. If the tag is not a naturally closing tag, then place a forward slash before the end bracket. For example, a <BR /> or an <IMG src="cms.png" />.

If you are unfamiliar with Jelly scripting, review these topics:

- **Jelly tags**
- **Extensions to Jelly syntax**
- **Jelly escaping types**

Include the following tag with all Apache Jelly scripts.

```xml
<j:jelly trim= "false" xmlns:j= "jelly:core" xmlns:g= "glide" xmlns:j2= "null" xmlns:g2= "null" >

The tag looks complex, but keep the following information in mind.

- Apache Jelly script uses multiple namespaces.
- There are two types of prefixes in tags: j and g. The j prefix is used for tags that are natively part of Apache Jelly. The g prefix is used for tags that the ServiceNow platform created and is using for platform purposes.

The j2 and g2 prefixes are just like j and g, except that they are processed in a second phase. The Apache Jelly script parser runs through each j and g tag respectively. For example:

```xml
<j:jelly trim="false" xmlns:j="jelly:core" xmlns:g="glide" xmlns:j2="null" xmlns:g2="null">
    <j:set var="jvar_phase1" value="Hello" />
    <j2:set var="jvar_phase2" value="World" />
    ${jvar_phase1} $[jvar_phase2]
</j:jelly>
```
In phase 1, the parser runs through all the j and g tags. It then caches the result. Before it runs the second phase, it takes the j and g namespaces and moves the namespaces to the second phase. It looks something like the following code.

```xml
<j:jelly trim="false" xmlns:j="jelly:core" xmlns:g="glide"
xmlns:j2="jelly:core" xmlns:g2="glide">
<j2:set var="jvar_phase2" value="World" />
Hello ${jvar_phase2}
</j:jelly>
```

For subsequent calls of this script, only phase 2 is parsed.

**Note:** If you plan to use phase 2 Jelly tags (g2 and j2) on the Content Type [content_type] or Dynamic Content [content_block_programmatic] tables, select the Two phase option on the content form.

Another example is to create a report of all open incidents assigned to each group. For this purpose, you could use a report and save time, but it is a good example for learning Jelly. Start with the Jelly tag:

```xml
<j:jelly trim= "false" xmlns:j= "jelly:core" xmlns:g= "glide" xmlns:j2= "null"
xmlns:g2= "null">
</j:jelly>
```

First, you need a list of open incidents. Use a g2:evaluate tag. The evaluate tag runs the script. Anything inside the tag is parsed like a business rule, so, for example, you can call global business rules, script includes, and gliderecord.

```xml
<g:evaluate var="jvar_groups" object="true">
var gr = new GlideRecord("sys_user_group");
gr.orderBy('name');
gr.query();
gr;
</g:evaluate>
```

This script is in phase 1 because frequent changes to incident assignment groups are not expected. Also notice the var attribute on the evaluate tag. This attribute specifies what variable is set from this block. At the end of the script, there is a gr on a line by itself. That last line is what sets the variable.

You can omit the jvar_groups variable, but then all the variables in the evaluate tag become Apache Jelly variables. The object=true specifies that the variable is not a primitive data type. If object=true is omitted, the script would break because jvar_groups would only be able to hold items like integers and strings.

After the evaluate tag, loop through these groups and find the incidents for each one.

```xml
<g:evaluate var="jvar_groups" object="true">
var gr = new GlideRecord("sys_user_group");
gr.orderBy('name');
gr.query();
gr;
</g:evaluate>
<table>
<tr>
<th>Name</th>
<th>Incidents</th>
</tr>
j:while test=${jvar_groups.next()}
<tr>
<td>${HTML:jvar_groups.getValue('name')}\</td>
</tr>
</table>
```
You can include normal XML in the Apache Jelly script at any time. Since there is no namespace, the Apache Jelly script does not try to parse the XML tags. Notice the j:while loop. It is a normal while loop and can iterate through a GlideRecord object. Also notice that you output a value with $(HTML:jvar_groups.getValue('name')). Here are the important elements:

- The outer brackets, ${}, specify the output of the variable and the phase in which the variable is output: ${} means first phase, $[] means second phase.
- HTML before the expression is for escaping the output. The expression jvar_groups.getValue('name') is being escaped for HTML. For other types of escaping, there are JS (Javascript), NS (No Script), and some other options.

To select only one record and not iterate through many records, the code looks like the following example:

```xml
<j:jelly trim="false" xmlns:j="jelly:core" xmlns:g="glide" xmlns:j2="null" xmlns:g2="null">
    <g:evaluate var="jvar_groups" object="true">
        var gr = new GlideRecord("sys_user_group");
        gr.orderBy('name');
        gr.query();
        gr;
    </g:evaluate>
    <j:if test="${jvar_groups.next()}">
        We found ${HTML:jvar_groups.getValue('name')}
    </j:if>
</j:jelly>
```

**Content management and Jelly code examples**

**Header Example Code**

This dynamic content block needs to be active and have the “Two Phase” option clicked. The g:requires tag is including the UI script defined in the system whose name is "servicenow.website.globals". The file extension in the call is .jsdbx and is used only in the call to the UI script, not in the name of the script in the system. For JSDBX, the file being called is a JavaScript(.js) defined within the database (db) that needs to be cached (x).

```xml
<?xml version= "1.0" encoding= "utf-8" ?>
<j:jelly trim = "false" xmlns:j = "jelly:core" xmlns:g = "glide" xmlns:j2 = "null" xmlns:g2 = "null">
    <g:requires name = "servicenow.website.globals.jsdbx" />
</j:jelly>
```

**Page Title and Description Example Code**

This dynamic content block needs to be active. There are two actions within this code snippet. First is a forward-looking string container that allows site translation, the $(gs.getMessage('Your Text')) string call. The second action pulls in the page title and description, ${current_page.getName()} and ${current_page.getDescription()}.

```xml
<?xml version= "1.0" encoding= "utf-8" ?>
<j:jelly trim = "false" xmlns:j = "jelly:core" xmlns:g = "glide" xmlns:j2 = "null" xmlns:g2 = "null">
    <j:if test="${current_page.getName()=="Solutions"}"

        <h1 class = "page_name" > <b> <a href = "solutions.do?" title = "${gs.getMessage('Solutions')}" >${gs.getMessage('Solutions')}</a> </b> </h1>
        <p class = "page_description" >
```

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List Block Pulling From Knowledge Articles Example Code

This code example contains one of the best tricks in the CMS. Using the type field with draws from a number of defined list definitions to make slight, or very dramatic changes, to list display. Because the UI is open to configuration and innovation, this is a good opportunity to use design skills. Anyone who can use HTML and CSS knows that a basic list can be turned into a float grid or be made inline. The combinations are limited only by what the designer can dream up and code.

In the code example, there is a custom logo field (u_logo) added to the Knowledge form. The custom field displays customer logos, partner logos, and award images on the awards page. There are a number of different sections that use this list definition so efficient reuse is taking place.

- **div class="cms_knowledge_list customer_success"** - Begin by creating an outer container with a unique class name that can be used as a basis for CSS style selectors and rules. From the outer container, many of the child elements can be accessed for theming.
- **<g:for_each_record file="${current}" max="${jvar_max_entries}"** - Loop for list creation that calls the selected table record and the entries set on the list form.
- **<a href="knowledge.do?sysparm_document_key=kb_knowledge,${current.sys_id}" img src="${current.u_logo.getDisplayValue()}" alt="${current.text}" width="110px"** - Defines linking to the article detail in the knowledge base. For further reference, look at content types within the site definition and you will see some similarities. The knowledge.do? portion of the URL points to the knowledge detail page which (as mentioned above) is mandatory if you plan to call the knowledge base in your CMS site. The rest of the URL represents the syntax for calling a knowledge article by its sys_id. Each and every item housed within the system has a unique sys_id.
- **${SP}-${SP}${current.author.first_name}${SP}${current.author.last_name}** - This example is commented out and not used, but it is still interesting in that it has a jelly call ${SP} and it pulls the knowledge article's author by first and last name.
Style in Content Management

Content pages can be styled with CSS, just like any HTML website.

Three elements control CSS styles:

- **Style Sheets** are records containing CSS declarations.
- **Themes** are groups of style sheets that can be invoked together.
- **Frames** are UI macros that define the outer border of individual content blocks as they appear on a content page. Frames work by calling on particular definitions in the style sheets.

Style sheets

Styles sheets are standard Cascading Style Sheets (CSS) that define the look and feel of all elements within the interface.

Cascading Style Sheets (CSS) can either be internal (stored in the database) or external (hosted on the server), based on organizational needs. To define an internal style sheet, use standard CSS in the style field. Using external CSS allows the Content Management System to use the same CSS as a corporate website or other online resource.

Use an external style sheet by defining a URL that points to the .cssx file. If you upload a .cssx file to the platform, you can reference the .cssx file using a URL.

Content pages do not reference style sheets directly. To invoke a style sheet, you assign the style sheet to a Theme using the related list on the Theme form.

Design themes

Design themes are the convergence of structure and styling, making them a critical tool for creating a powerful user interface.

For a successful project, review the corporate style guide and communicate with the corporate website art team. If the organization has an art or design department that maintains branding, include them in this process.

A theme is a collection of one or more style sheets (CSS files) that define a consistent look for a set of pages. In most environments, many pages share a few themes. Use multiple themes within a site to create stylistic differentiators between site areas. You can also use a single theme to create one unified look and feel for the site.

*Customize a design theme*

A theme is a collection of one or more style sheets (CSS files) that define a consistent look for a set of pages.

Role required: content_admin or admin

Themes can be invoked in any of the following ways.

- Directly by content pages.
- As the default theme of a content site.
- On the configuration page as a global default.

1. Navigate to **Content Management Design Themes**.
2. Click New.
3. Type a name for the theme and mark it as Active.
4. Right-click the form header and click Save
The Style Sheet related list appears.

5. Use the Style Sheet related list to add style sheets to the theme.

Doctypes

The view_content html page template on which all CMS is based defaults to doctype=html.

The code looks like the following HTML source code.

```html
<!DOCTYPE HTML>
```

If your CMS site does not render properly, remove the doctype from the page by setting the following property:

- `glide.html.doctype.pages = chat_desktop, live_feed, live_feed_small, navigator, navpage11, image_browse`

The following is the default for this property.

- `glide.html.doctype.pages = chat_desktop, live_feed, live_feed_small, navigator, navpage11, image_browse, view_content`

Setting this doctype offers these benefits for building new sites:

- Incorporating common practice: Use a practice that is becoming widely adopted across the Internet and can prevent certain browsers from running in quirks mode.
- Cleaner CSS and markup: Write more standards-based CSS and markup to promote code sharing.
- A step towards browser compatibility: Find solutions that work across browsers and avoid browser-specific workarounds.

Format a frame

Frames provide a way to manage decorative containers for content blocks and any other elements within the site. For example, one frame can be a container, made of div or span tags, that is styled with rounded corners.

Role required: content_admin or admin

Individual content blocks use a frame UI macro to define the frames. When viewing a content block form, the Frame field offers a choice between the different frame UI macros. The frame UI macro does not, however, have the definition for the frame within its Jelly script. Instead, it references a particular frame as defined in a style sheet.

Configuring a new frame is a two-step process.

1. Define the frame in a style sheet.
2. Create the frame UI macro to invoke the frame definition.

**Define a frame in a style sheet**

Add style definitions for any custom frame UI macro you create.

Role required: content_admin or admin

Each frame has its own class name.

1. Navigate to Content Management Design Style Sheets.
2. Select a style sheet to contain the frame definition.
   - Base system themes use a separate Frames style sheet.
3. Add the following code, substituting the desired frame name and style:
   
   ```html
div.FRAMENAME{border:STYLE;}
```

4. Click Update.

Create a frame UI macro
Copy an existing frame UI macro to display content in a custom frame.

Role required: content_admin or admin

Create a custom frame UI macro if you want to control the style of the frame with your own style sheet definitions.

1. Navigate to Content Management Design Frames and select one of the existing frame UI macros.
2. Change the name to match the FRAMENAME you used in the style sheet.
3. Right-click the header bar and select Insert and Stay.
4. Update the frame name in the XML field as shown:
   
   ```xml
   <div class="FRAMENAME">
   ```

5. Click Submit.

• In any content block form, select the UI macro.
• Define the frame in a style sheet.

Content Management meta tags
Meta tags are special tags in web pages that contain information about the page but are not rendered with the page. You can define custom meta tags for content pages.

Meta tags are not noticeable to a page visitor unless the visitor looks at the page source code. Web search engines read meta tags as they "crawl" the web, identifying and organizing content. Modern website designers often use meta tags to embed "hints" to search engines about how to index or otherwise crawl the site.

Structurally, a meta tag consists of a tag and a name/content pair and looks similar to the following code.

```html
<meta name="generator" content="MediaWiki 1.16wmf4" />
```

The Content Management System allows you to define both site level and page level tags.

Configure a page level meta tag
A page level tag is a meta tag defined on a specific page and included on only that page.

Role required: content_admin or admin

If an individual page has a specific tag with the same name as the site, the page tag takes precedence.

1. Navigate to Content Management Pages.
2. Open the page.
3. If not already included, add the Meta Tags related list to the form.
4. In the Meta Tags related list, click New.
5. Type a Name and Content for the tag.
6. Click Submit.

Configure a site level meta tag
A site level tag is a meta tag is defined on a site and included on every page within that site.
Role required: content_admin or admin

If an individual page has a specific tag with the same name as the site tag, the page tag takes precedence.

1. Navigate to Content Management Sites.
2. Open the site.
3. If not already included, add the Meta Tags related list to the form.
4. In the Meta Tags related list, click New.
5. Enter a Name and Content for the tag.
6. Click Submit.

Configure DIV-based layouts

After you create your site, you can change the site layout with DIV tags.

Role required: content_admin or admin

Many web page layouts use tables for a consistent look and feel. Tables are effective for numbers and statistics, but can be limiting for designing other types of information. DIV tags are flexible block-element tags. To use DIV tags for layouts, give the tag an ID and assign attributes using CSS.

Changing to CSS and DIV tags help in the following ways:

- simplify code
- reduce the amount of code
- increase page load speed
- separate content from presentation
- help pages adapt to different device resolutions
- make pages easier for search engines to crawl
- make code more compliant with evolving web page design standards

A theme named Administration Theme - Charcoal is included as an example of CSS-driven, DIV-based layouts. To view the Administration Theme - Charcoal DIV-based layout, complete the following steps.

1. Navigate to Content Management Design Layouts.
2. Click Admin 1 Column
3. Review the code.

Content meta tag hierarchy

Page and site level meta tags are included in a content meta tag hierarchy.

Site and page level tags

CMS supports page level and site level tags. The system behavior is to show the sum of all page level and site level tags. For example, if you have two tags on the site and one tag on the page, all with different names, you see three tags on the page. Two are from the site and one is from the page. If both the site and the page have a tag of the same name, only the page tag is used.

Note: The Content Management System does not support some commonly used meta tags. For example, you cannot use the X-UA-Compatible meta tag, which allows you to specify which version of Internet Explorer a site should be rendered in.
Example: all tags have unique names

<table>
<thead>
<tr>
<th>Name</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>breakfast</td>
<td>eggs</td>
</tr>
<tr>
<td>lunch</td>
<td>sandwich</td>
</tr>
</tbody>
</table>

Output

<table>
<thead>
<tr>
<th>Name</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>breakfast</td>
<td>eggs</td>
</tr>
<tr>
<td>lunch</td>
<td>sandwich</td>
</tr>
<tr>
<td>dinner</td>
<td>steak</td>
</tr>
</tbody>
</table>

Example: page level tag overrides site level tag

<table>
<thead>
<tr>
<th>Name</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>breakfast</td>
<td>eggs</td>
</tr>
<tr>
<td>lunch</td>
<td>sandwich</td>
</tr>
</tbody>
</table>

Page Level

<table>
<thead>
<tr>
<th>Name</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>lunch</td>
<td>tacos &lt;--- overrides site level</td>
</tr>
<tr>
<td>dinner</td>
<td>steak</td>
</tr>
</tbody>
</table>

Output

<table>
<thead>
<tr>
<th>Name</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>breakfast</td>
<td>eggs</td>
</tr>
<tr>
<td>lunch</td>
<td>tacos</td>
</tr>
<tr>
<td>dinner</td>
<td>steak</td>
</tr>
</tbody>
</table>

Content Management integration points

Integration points use content blocks in CMS to link different applications together using static and dynamic methods.

By using integration points, users can connect to different systems from a single page. The power of the CMS is that it can display any data within the ServiceNow platform. The ESS portal, for example, connects users to a service catalog, a knowledge base, and a help and incident reporting site. Each section contains a set of links to additional content. List blocks offer the easiest way to display data dynamically. Content types define how lists link to the detailed data they reference.

Generating lists from the ServiceNow platform is straightforward, especially if you use filtering. When the CMS was first introduced, lists were the only method available to create navigational systems for sites. Content types define system record links using specific templates to define the list and the details.

- Summary template: defines the list
- Detail template: defines the detail as it is rendered in a page.

The templates work together to pass data attributes or unique record identifiers (sysid) into a single detail page that manages the data. Any attribute variations use the URL sent to the page.
Understanding how content types work can mean the difference between a site with 20 pages versus a site with 200 pages. There is a time for both types of data calls. Depending on the task, there are appropriate times to use static content and times for dynamic methods.

**View links between system elements and URLs**

You can view the links between your system elements and their URLs to render more specific content within your site.

Role required: content_admin or admin

See the [Navigate to a record or module using a URL](#) page for an overview of URL syntax in the ServiceNow platform.

The Incidents list offers a quick example of viewing a form within its own tab. This viewing method illustrates how to append the URL string to render more specific content within your site.

1. Navigate to Incident All.
2. Right-click in a blank area within the content frame and select Open Frame in New Window or Open Frame in New Tab.

The URL returned looks similar to this example.

```<instance_name>/incident_list.do?sysparm_userpref_module=b55b4ab0c0a80009007a9c0f03fb4da9```

The URL is comprised of the following elements.

- `incident_list.do?` is the call to the list with no parameters passed into it. Explore context menu options and list filtering variations to see how the URL string is appended with each action.
- `incident_list.do?sysparm_query=&sysparm_view=ess` is an example of how the view is passed in the URL string.
- `incident_list.do?sysparm_query=GROUPBYactive&sysparm_view=ess` is how the URL looks when the group by option is chosen from the context menu.
- `incident_list.do?sysparm_query=category%3Dsoftware` is the result of applying a category is software filter to the list.

Explore all the options available within the right-click menu. Click through to the Incident form itself (incident.do) to see what the URL string does when parameters are passed into it.

**Element link examples**

View examples that show how to create a site pointing to various system data in several different data tables.

The following examples illustrate setting up access to the following system data.

- **Knowledge:** building a versatile front end for a knowledge base, from overview page to variations on the list definitions used in the site.
- **Catalog:** ideas for a business-to-consumer shopping experience that pulls various items and forms from your service catalog.
- **Service Portfolio:** using the business service portfolio to contain all defined services offered by your organization.
- **Featured reports:** methods for linking to the most important reports.
Page source view

Use the tools available in your browser to view the frame source page and understand what URL address bars pass between system frame sets.

The Firefox browser, for example, has the developer tools option. This option provides an easy way to view records that render within the main content frame (gstf_main) of the ServiceNow platform. Also, Firefox quickly builds menus and links to records within the system.

This Firefox functionality is useful when stepping through the menu items section.
Static methods

Static methods in the CMS application were created for ease of use.

Form-based menu management and WYSIWIG code editing can be useful to both advanced and entry-level users. The technical ability of subject matter experts (SMEs) managing the language of your site can vary considerably. Letting SMEs write the content and having a technical resource manage the linking expedites menu and link creation within the system.
Navigation Menu Links

Use base system templates to group similar links for placement on the page. Though the terminology is different (menu sections and menu items), this type of linking behaves the same way as content links. For more information on creating a navigation menu block, see *Create a navigation menu block* on page 419.

Static HTML Details

Content blocks that are useful for areas administered by developers unfamiliar with HTML or markup. Anyone familiar with markup can use dynamic blocks because they are extendable. For more information on static HTML, see *Using Content Blocks*.

Content Links

The predecessors to navigation menus from when the CMS was first introduced. Use content links to make navigational links by defining several content links under the same category. Then, call the links...
London    ServiceNow    Now Platform  Capabilities

as a list referencing the Content Link [content_link] table.

**iFrame Details**

Used both dynamically and statically throughout the system. Using them is an easy way to bring any form or list into your CMS pages. For more information on iFrame methods, see *Using Content Blocks*.

**Dynamic methods**

While static methods are a powerful navigational tool, you have more control over data rendering using the dynamic methods.

Reference common code in the system to make long-term maintenance of the site easier. Coding skills are useful when implementing dynamic methods.
**Dynamic Blocks**
These blocks are where the majority of your work resides. For more information, see *Configure dynamic blocks* on page 433.

**Frames**
Frames are meant to be decorative wrappers around any block in the system. They are mentioned with dynamic blocks because frames are essentially UI macros with the category of Frame. Frames apply the ${body} variable to a block and define where the block is inserted when rendered on the page.

**Lists**
Lists generate links to records based on the filtering rules you define. Lists can be sorted for presentation by any field in the corresponding record.Lists help supplement navigation and pull data from outside the CMS. For more information, see *Customize the list block* on page 434.
Content Types

Content types provide site-specific control of how system data defined as templates is rendered. The rendering of lists is considered first (summary templates). The next consideration is the detail template, which allows control over the record rendering.

List Definitions

List definitions enable you to extend the summary template defaults defined on the site level. Used with frames, list definitions render the same data differently based on the placement on the page or site. For more information, see Configure list definitions on page 435.

Detailed Content

Detailed content in page detail settings) are blocks that display the content of an existing document as a block on a content page. For more information, see Configure a detailed content block on page 441.

Example integration points

Each element on the page links to a specific URL point.

Figure 91: Integration points

Business Services links to a content page (CMS page referenced: Business Service Portfolio, URL: (business_service_category.do) that pulls the system service catalog homepage into a frame within the content area. Each link within this section uses the browse by category page, where you pass in the name of the category to return results.
• Target page iFrame URL: catalog_home.do?
sysparm_nameofstack=aabdae07ef22100914304167b22567d&sysparm_view=business&sysparm_clear_stack=yes
• Target page frame name: gsft_main
  • Desktop Computing URL: category_browse.do?category=Desktop Computing
  • Business Applications URL: category_browse.do?category=Business Applications
  • Communications Services URL: category_browse.do?category=Communications Services
  • Infrastructure Services URL: category_browse.do?category=Infrastructure Services
  • Hosting Services URL: category_browse.do?category=Hosting Services

Featured Services links to a content page which pulls a small subset of services into an iFrame.
• iFrame URL: com.glideapp.servicecatalog_category_view.do?
sysparm_parent=d67c446ec0a80165000335aa37eafbc1&sysparm_view=
• Frame name: gsft_main
  • Install Software URL: catalog.do?uri=com.glideapp.servicecatalog_cat_item_view.do?
sysparm_id=10d69689c611227600ffeba41c664824
  • Email Account URL: catalog.do?uri=com.glideapp.servicecatalog_cat_item_view.do?
sysparm_id=d67a866b6c0a80165009386c752cd4a09
  • Electronic Messaging URL: catalog.do?uri=com.glideapp.servicecatalog_cat_item_view.do?
sysparm_id=533798810a0a0b26001f1a03593e19058
  • VPN RSA Token URL: catalog.do?uri=com.glideapp.servicecatalog_cat_item_view.do?
sysparm_id=d67b099ac0a801650199d0c276b772502
  • Shared Storage (SAN) URL: catalog.do?uri=com.glideapp.servicecatalog_cat_item_view.do?
sysparm_id=cedd458a0a0a0b8300c3b1e32e7a3ac2

Reporting links to a content page that pulls the reports page into an iFrame. All links within this menu leverage homepages in the system, which creates an issue with the home.do URL. Notice in the following links that ..../ is used to create a relative URL outside of the CMS site home.do definition. Without this path, the site homepage would render within the iFrame.
• iFrame URL: report_home.do
• Frame name: gsft_main
  • Cost Management Overview URL: ../home.do?sysparm_userpref_homepage=fa81ae91c0a805c64c0942ab2e4b852b
  • Administration Overview URL: ../home.do?sysparm_userpref_homepage=8b7b11f6c611228901f3fcbdb3cc8f
  • Portfolio Overview URL: catalog_home.do?sysparm_view=business
  • Service Availability URL: ../home.do?sysparm_userpref_homepage=8ee772000a0a0bad00c38eb7e688b93d0
  • Service Level Agreements (SLA) URL: ../home.do?sysparm_userpref_homepage=757e86a30a0006d4010a6851639498d1

Content Management testing

Test your site to ensure that all pages display correctly, links go to the specified address, and images are not broken. It is important to test the site as you build it. Do not wait until just before launch to begin testing.

Also, test templates as you create them so any issues are resolved before creating other content based on the templates. Recruit as many people as possible to help you test.
Here are some general site testing guidelines:

- Test on the browsers and platforms your site visitors use
- Test on various monitors (for example, LCD and CRT)
- View pages using different screen resolutions
- View pages using different color settings
- Test all navigation and links
- Test items that can be downloaded (for example, PDF files)
- Test the search functionality
- Test site security
- If necessary, test for accessibility (for guidelines, see the W3C Website Accessibility Initiative)

Global search in Content Management

When you add global search to a CMS site, two different search result blocks can display, depending on the user role: global or no global.

Roles are defined at System Properties Global Text Search.

- Search Results (Global): For users with permission to use the global search within the normal frame set. The normal frame set is defined as the default, non-CMS user interface with the set of frames.
- Search Results (No Global): For users without permission to use the global search. Searches only the knowledge base and the catalog.

The header search bar and the Search dynamic block in the base system both automatically handle the permissions and direct the user to the appropriate search results. In the base system, the search result blocks are deployed on the same Search Results content page.

In order for the global search to work properly, it is important to ensure that the DEFAULT directs users to a working content page. If not, the results from the global search link back to the frame set, not to pages within the CMS site.

**Note:** The global search is similar to the normal frame set user interface and ties to the same roles (Set global text search properties).

Search Results (Global)

Before you use the Search Results (Global) dynamic block, define content types to control the behavior a search result is clicked. If no content type is defined for a table, selecting a link on that table renders the results according to the DEFAULT content type. It is good practice to point the DEFAULT content type to a page with a normal "Current Document" detailed block. Set the content type detail (Detail Template field) to have just an iFrame.

The Search Results (No Global) dynamic block does not require any additional configuration.

CMS translation

You can translate CMS sites by activating internationalization plugins and manually translating custom interface strings.

Two tables support the translation of a CMS site into other languages.

- Translated Name / Field [sys_translated]: Stores strings that are shared or commonly used within a site. These include menu section names, menu item names, site breadcrumb names, link names, and footer
menu links. Internationalization plugins typically provide translations for these strings. See [Localization settings](#).

- **Translated Text [sys_translated_text]**: Stores unique string translations which you create when you manually translate interface elements. See [Translate the interface](#).

**View a translated CMS site**

Activating an internationalization plugin provides a quick way to see translated strings for CMS menus, breadcrumbs, and links. For a full translation, you must translate the instance manually.

The following example explains how to view a translated site in Japanese.

1. Navigate to **System Definition Plugins**.
2. In the Go to filter, select Name, enter I18N, and then press the Enter key.
3. Activate both the I18N - Japanese Translations and the I18N: Knowledge Management Internationalization Plugin v2 plugins.
4. Refresh the browser.
6. Browse the site to see the translated language strings.
7. Navigate to the ESS Portal. The path is: http://Instance Name.service-now.com/ess/.
8. Browse the site to see the translated language strings in the ESS Portal.

**Connect**

ServiceNow® Connect is a real-time messaging platform that connects you to your coworkers, bypassing email and static documents.

Connect integrates with other features within the system, such as Visual Task Boards, Human Resources Management, and Customer Service Management. The Connect interface overlays the standard interface, which allows users to participate in conversations while they work.

Connect contains the following features:

- **Connect Chat**: Enables users to chat with individuals and groups, quickly share files, and collaborate on any record by connecting with the right people instantly.
- **Connect Support**: Enables support agents to provide real-time assistance to end users, using queues. Requires the Connect Support plugin.

UI16 or UI15 is required to use Connect.

**Note:**

- Connect does not replace legacy chat but offers some of the same functionality. Do not use these features concurrently.

**Supported browsers for Connect**

The system supports Connect Chat and Connect Support on most modern browsers.

- The latest public release of Firefox or Firefox ESR
- The latest public release of Chrome

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• Safari version 9.1 and later
• Internet Explorer version 11
  • Edge mode is supported.
  • Compatibility mode is not supported.
  • Setting Security Mode to High (via the Internet Options Security tab) is not supported.
  • Internet Explorer 11 is susceptible to memory leaks, which may impact performance, especially in Windows 7.

Activate Connect

Connect is active by default on new instances. For upgraded instances, you can activate the Connect plugin (com.glide.connect) if you have the admin role.

Role required: admin

If you used Collaboration in the Fuji release, the Connect plugin is activated automatically.

1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.
   If the plugin depends on other plugins, these plugins are listed along with their activation status.
   If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).
4. If available, select the Load demo data check box.
   Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.
   You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.
5. Click Activate.

Properties installed with Connect

Properties are added with activation of Connect.

Note: To open the System Property [sys_properties] table, enter sys_properties.list in the navigation filter.
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>collaboration.email_interval</td>
<td>Sets the number of minutes the system waits before sending a Connect notification email to an inactive user.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 3</td>
</tr>
<tr>
<td></td>
<td>• Location: Collaborate Administration Properties</td>
</tr>
<tr>
<td></td>
<td>• Learn more: <a href="#">Configure the email notification interval</a></td>
</tr>
<tr>
<td>collaboration.frameset</td>
<td>Determines whether the Connect overlay is visible (enabled). This property also impacts Connect Support.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td></td>
<td>• Location: Collaborate Administration Properties</td>
</tr>
<tr>
<td></td>
<td>• Learn more: <a href="#">Disable the Connect overlay</a></td>
</tr>
<tr>
<td>collaboration.polling_interval</td>
<td>Sets the number of seconds the system waits between polling for new Connect messages. This property also impacts Connect Support.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 10</td>
</tr>
<tr>
<td></td>
<td>• Location: System Property [sys_properties] table</td>
</tr>
<tr>
<td>connect.notification.audio_alert</td>
<td>Specifies the audio file to play to notify users of new messages, support conversation transfers, and @mentions in Connect. This property's value must point to the Name field of a record in the Audio File [db_audio] table. This property also impacts Connect Support.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: connect_alert.mp3</td>
</tr>
<tr>
<td></td>
<td>• Location: Collaborate Administration Properties</td>
</tr>
<tr>
<td></td>
<td>• Learn more: <a href="#">Customize the Connect audio notification sound</a></td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| connect.retrieve_external_link_content | Enables Connect to render URLs for external sites as links. When this property is disabled, URLs that point anywhere outside the instance appear as plain text. This property also impacts Connect Support.  
  • Type: true | false  
  • Default value: true  
  • Location: Collaborate Administration Properties |
| connect.roles                       | Determines which user roles are required to access Connect. When the value is blank, no role is required. This property also impacts Connect Support.                                                              
 Note: If you choose to restrict Connect access to specific roles, consider updating the role requirements for Connect modules and other access points.  
  • Type: string  
  • Default value: <empty>  
  • Location: Collaborate Administration Properties |
| glide.connect.enabled               | Hides the Create or Join Chat Room related link, which appears on the Incident form when legacy chat is enabled. Legacy chat and Connect Chat should not be used concurrently and this property should not be modified.  
  • Type: true | false  
  • Default value: true  
  • Location: Collaborate Administration Properties |
| glide.connect.chat.disabled         | Disables and hides all UI elements related to Connect.                                                                                                                                                      
  • Type: true | false  
  • Default value: false  
  • Location: System Property [sys_properties] table |
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.live_feed.task_header_button</td>
<td>Determines whether the show live feed icon ( undefeated ) and Follow button are available in the form header of tables that have the live_feed=true dictionary attribute.</td>
</tr>
<tr>
<td></td>
<td>• Type: choice list</td>
</tr>
<tr>
<td></td>
<td>• Default value: collaboration</td>
</tr>
<tr>
<td></td>
<td>• Other possible values:</td>
</tr>
<tr>
<td></td>
<td>• both: enables both the show live feed icon and the Follow button.</td>
</tr>
<tr>
<td></td>
<td>• live_feed: enables the show live feed icon.</td>
</tr>
<tr>
<td></td>
<td>• none: disables both the show live feed icon and the Follow button.</td>
</tr>
<tr>
<td></td>
<td>• Location: Collaborate Administration Properties</td>
</tr>
<tr>
<td></td>
<td>• Learn more: Configure record conversations</td>
</tr>
</tbody>
</table>

### Activate Connect Support

You can activate the Connect Support plugin (com.glide.connect.support) if you have the admin role. This plugin includes demo data.

**Role required:** Admin

If you are currently using the legacy chat feature to provide help desk support, close any open help desk chats before activating Connect Support. Legacy chat and Connect Support should not be used concurrently. When you activate Connect Support, the system automatically sets the state of all Chat Queue Entry [chat_queue_entry] records to Closed Complete. This ends any open help desk chats. For more information, see [Migrate from legacy chat to Connect Support](#) on page 508.

1. Navigate to System Definition Plugins .
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.

   If the plugin depends on other plugins, these plugins are listed along with their activation status.

   If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).

4. If available, select the Load demo data check box.

   Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.

   You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.
5. Click Activate.
## Properties installed with Connect Support

Properties are added with activation of Connect Support.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>connect.support.conversation_limit</td>
<td>Determines how many support conversations an individual agent can have at one time. When the value is set to -1, an agent can participate in an unlimited number of conversations.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: -1</td>
</tr>
<tr>
<td></td>
<td>• Location: Collaborate Support Administration Properties</td>
</tr>
<tr>
<td>connect.support.idle.delay</td>
<td>Determines how many seconds a user must be inactive in a support conversation before an idle countdown timer appears.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 120</td>
</tr>
<tr>
<td></td>
<td>• Location: Collaborate Support Administration Properties</td>
</tr>
<tr>
<td>connect.support.idle.count_down</td>
<td>Determines how many seconds the idle countdown timer remains open after it appears. If the idle user does not dismiss the timer before the countdown completes, the system closes the support session.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 60</td>
</tr>
<tr>
<td></td>
<td>• Location: Collaborate Support Administration Properties</td>
</tr>
<tr>
<td>connect.support.show_agent_avatar</td>
<td>Determines whether an agent's avatar is shown in a support conversation (enabled). When the property is disabled, users see the agent's name only.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td></td>
<td>• Location: Collaborate Support Administration Properties</td>
</tr>
</tbody>
</table>
### Name

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| connect.support.user.closed.conversation_limit | Determines how many closed conversations appear in a user's support conversation history. When the value is set to 0, all previous conversations appear in the history.  
  - Type: integer  
  - Default value: 0  
  - Location: Collaborate Support Administration Properties |
| glide.connect.support.enabled | Disables or enables Connect Support. When the property is enabled, the Service Desk Chat button in the Employee Self-Service portal opens the conversation in Connect Support, rather than legacy chat. Additionally, the Support tab appears in the Connect sidebar.  
  - Type: true | false  
  - Default value: true  
  - Location: Collaborate Support Administration Properties |
| glide.connect.support.reflect_system_messages | Controls whether Connect Support reflects system messages in records created from a support chat, for example, transfer notices, automated queue messages, etc.  
  - Type: true | false  
  - Default value: false  
  - Location: System Property [sys_properties] table |

### Additional plugins for Connect Support

Additional plugins are available for Connect Support. These plugins integrate Connect Support with other features and provide capabilities to track performance metrics.

You must have the admin role to activate these additional plugins. For details, see [Activate a plugin](#).

Table 92: Additional plugins for Connect Support

<table>
<thead>
<tr>
<th>Plugin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plugin</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Connect Support Manager's Dashboard</td>
<td>Provides a homepage for Connect Support, and all required configuration records. Though the plugin name contains the term dashboard, the plugin does not provide functionality related to Performance Analytics dashboards. Homepages are similar to dashboards, but do not require Performance Analytics roles to view.</td>
</tr>
<tr>
<td>[com.glide.connect.managers_dashboard]</td>
<td><strong>Note:</strong> The Connect Support Manager's Dashboard plugin does not activate Connect Support automatically. You must activate Connect Support to collect data for the homepage.</td>
</tr>
<tr>
<td>Human Resources Application: HR Connect</td>
<td>Sets up a human resources (HR) chat queue and makes it available on the HR Service Portal. The Human Resources Application: HR Connect plugin activates these related plugins if they are not already active: • Human Resources Application: Core [com.snc.hr.core]: Provides basic HR features.</td>
</tr>
<tr>
<td>[com.snc.hr.hr_connect]</td>
<td></td>
</tr>
<tr>
<td>Performance Analytics - Content Pack - Service Desk Chat</td>
<td>Provides the Service Desk Chat Monitor dashboard, which analyzes key Connect Support metrics and indicators. The Performance Analytics - Content Pack - Service Desk Chat plugin activates these related plugins if they are not already active: • Connect Support Manager's Dashboard [com.glide.connect.managers_dashboard]: See description in this table.</td>
</tr>
<tr>
<td>[com.snc.pa.chat]</td>
<td></td>
</tr>
<tr>
<td>Performance Analytics - Context Sensitive Analytics for Chat</td>
<td>Provides in-form analytics for Connect Support. These analytics are available as a related link on the Chat Queue Entry [chat_queue_entry] form, and also as the Context Sensitive Analytics - Chat dashboard. The Performance Analytics - Context Sensitive Analytics for Chat plugin activates these related plugins if they are not already active: • Performance Analytics - Content Pack - Service Desk Chat [com.snc.pa.chat]: See description in this table.</td>
</tr>
<tr>
<td>[com.snc.pa.chat.context_sensitive_analytics]</td>
<td></td>
</tr>
</tbody>
</table>
Connect interface

Users can work in a compact view of Connect, which overlays the standard user interface, or in a full-screen workspace.

Connect Chat and Connect Support share the same interface, so support agents can keep track of all their conversations in one place.

Connect overlay

The Connect overlay appears over the standard user interface. It consists of the Connect sidebar, which is the primary interface for Connect Chat and Connect Support, and any Connect mini windows that are open. Each mini window contains a header, a conversation area, and a message field.
Note: An administrator can disable the Connect overlay so users can only use the Connect workspace, a full-screen interface with additional Connect tools.

Connect sidebar

The Connect sidebar is the primary interface for Connect Chat and Connect Support. It lists your conversations and provides access to create conversations.

The sidebar is collapsed by default. Click the toggle Connect sidebar icon in the banner frame to expand or collapse the sidebar, which appears on the right edge of the interface.

Connect Chat

The chat view of the sidebar is available to all users. If Connect Support is enabled, users must click the chat tab of the sidebar, which is represented by a speech bubble icon. If Connect Support is not enabled, there are no tabs in the sidebar and the chat view displays by default.

The chat view of the sidebar lists all your current Connect Chat conversations. It also contains a filter tool and a button to create conversations.
If you have unread messages in a conversation, a number appears by the conversation in the sidebar. Point to a conversation and click the x icon to remove the conversation from the sidebar.

**Connect Support**

The support view of the sidebar is available when Connect Support is activated. The support view is visible only to users who are agents for at least one support queue. Users must click the support tab of the sidebar, which is represented by a headset icon.

The support view displays Queues to which you belong. It also displays your open support conversations under Cases.
If you have unread messages in a conversation, a number appears by the conversation in the sidebar.

Figure 94: Support view of the Connect sidebar

Connect mini windows

When you open a Connect Chat or Connect Support conversation in the Connect overlay, it opens in a Connect mini window. Each mini window contains a header, a conversation area, and a message field. Several icons appear in the mini window header and by the message field.

Note: The icons you see for each conversation depend on the conversation type and other conditions.
<table>
<thead>
<tr>
<th>Icon</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="icon" alt="Add user" /></td>
<td>Add user</td>
<td>Add a user to the conversation. This icon is visible for group and record conversations only. Administrators can enable this icon for Connect Support conversations.</td>
</tr>
<tr>
<td><img src="icon" alt="View document" /></td>
<td>View document</td>
<td>View the record associated with the conversation. This icon is visible for record and support conversations only.</td>
</tr>
<tr>
<td><img src="icon" alt="New window" /></td>
<td>New window</td>
<td>Open the conversation in the Connect workspace, a full-screen window with additional Connect tools.</td>
</tr>
<tr>
<td><img src="icon" alt="Collapse/Expand conversation" /></td>
<td>Collapse/Expand conversation</td>
<td>Hide or show the conversation. Alternatively, click anywhere in the mini window header to the left of the icons.</td>
</tr>
<tr>
<td><img src="icon" alt="Close window" /></td>
<td>Close window</td>
<td>Close the mini window. The conversation remains in the Connect sidebar and the history is preserved when you reopen the conversation. You can also close a mini window by pressing the Escape key.</td>
</tr>
<tr>
<td><img src="icon" alt="Connect actions" /></td>
<td>Connect actions</td>
<td>Open the Connect actions menu, which contains options like Transfer and Create Incident. This icon is visible only when Connect actions are available for the conversation. By default, this icon is visible for support conversations only. Administrators can add options to this menu by creating Connect actions.</td>
</tr>
<tr>
<td><img src="icon" alt="Message type" /></td>
<td>Message type</td>
<td>Choose whether messages are added to the associated record as comments or work notes. This icon is visible only for record and support conversations.</td>
</tr>
<tr>
<td>Icon</td>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>---------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>📄</td>
<td>Attach file</td>
<td>Attach and send a file. Select one or more files and click Open. You can also add an attachment by dragging and dropping it directly in the conversation.</td>
</tr>
</tbody>
</table>

**Connect workspace**

The Connect workspace is a full-screen view of all your Connect Chat and Connect Support conversations in one place. It contains the conversation pane, which displays the conversation header and an expanded version of the mini window, and the conversation tools area.

To open the Connect workspace, navigate to Collaborate Connect Chat or click the new window icon

in a Connect mini window. If you do not have any recent conversations, a screen appears with helpful information about Connect.

The Connect workspace is composed of the following elements.

**Table 94: Connect workspace elements**

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sidebar</td>
<td>Provides access to conversations. The Connect sidebar behaves the same way in the workspace as it does in the Connect overlay. The only difference is that the sidebar appears on the left edge of the Connect workspace. For more information about using the sidebar, see <a href="#">Connect sidebar</a>.</td>
</tr>
<tr>
<td>Conversation pane</td>
<td>Displays the currently selected conversation.</td>
</tr>
<tr>
<td>Conversation tools</td>
<td>Provides quick access to key information, conversation members, attachments, and notification preferences for the currently selected conversation. Some of the conversation tools vary depending on the type of conversation.</td>
</tr>
</tbody>
</table>
Figure 95: Connect workspace
Conversation pane

The conversation pane of the Connect workspace displays the conversation header and an expanded version of the mini window.

The header displays basic conversation details like the avatar and name. You can edit these details for group or record conversations.

Below the header, messages appear in chronological order. You can enter messages in the text entry field at the bottom of the window.

Connect conversation tools

The conversation tools area in the Connect workspace contains several tabs, each represented by an icon.

Click an icon to open the tab. Click the same icon again to hide the tab. The tabs you see for each conversation depend on the conversation type and other conditions.
## Table 95: Conversation tool tabs

<table>
<thead>
<tr>
<th>Tab icon</th>
<th>Tab name</th>
<th>Description</th>
</tr>
</thead>
</table>
| ![info icon](image) | Info | Contains the following sections, each of which appears only if it contains information.  
- **Record**: Lists details about the record the current conversation follows, such as record number, state, assignee, and short description. The fields displayed in this section vary by the type of record. This section is available only for record conversations.  
- **Related Records**: Lists Visual Task Boards and task records that have been referenced in the conversation, such as incidents, problems, or changes. When you send a record number as a message or drag a record in a conversation, it appears as a link. The list displays the short description for each task. Click a task to open the record in a new browser tab. Only conversation members who have rights to view the tasks can access them.  
- **Links**: Lists URLs that have been referenced in the conversation. Click a link to open the destination page in a new browser tab.  

This tab is not available for support conversations. |
| ![record icon](image) | Record | Displays a compact form view of a record created from the current conversation, such as an incident. If more than one record has been created from the conversation, there is a separate record tab for each one. These tabs are available only for support conversations. |
Enable or disable Connect notifications globally

You can edit your Connect notification settings globally to enable or disable mobile, desktop, email, or audio notifications for all your Connect Chat and Connect Support conversations.

Role required: none

By default, Connect mobile, email, and audio notifications are enabled globally. You must enable desktop notifications.

An administrator can customize the sound used for audio notifications.

**Note:** You receive mobile notifications only if you have installed the ServiceNow mobile app.

1. In the banner frame, click the gear icon (⚙️) to open the system settings.
2. In the system settings window, click the Notifications tab.
3. In Notifications by Category, navigate to Connect.
4. Enable or disable Connect mobile, desktop, email, or audio notifications.
5. Configure the following system notifications. For more information on how to configure system notifications, see *Apply notification conditions* on page 829.

<table>
<thead>
<tr>
<th>Notification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity Stream @Mention Email</td>
<td>Sends an email alert to a user anytime they get @mentioned in an activity stream</td>
</tr>
<tr>
<td>Notification</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Collaboration Offline Group Message(s)</td>
<td>Sends email to offline users who are members of a group conversation after a certain number of minutes determined by the collaboration.email_interval property to limit spam</td>
</tr>
<tr>
<td>Collaboration Offline Message Bundle</td>
<td>Sends email to offline users after a certain number of minutes determined by the collaboration.email_interval property to limit spam</td>
</tr>
<tr>
<td>ConnectMessagePushNotification</td>
<td>Uses a push notification to inform users when there are new messages in a conversation</td>
</tr>
<tr>
<td>ConnectNotificationPushNotification</td>
<td>Uses a push notification to inform a user when they have been @Mentioned in a record</td>
</tr>
</tbody>
</table>

Edit which notifications you receive *for a specific conversation*.

**Connect notification browser support**

The following browsers support Connect chat notifications.

**Table 96: Connect chat browser support**

<table>
<thead>
<tr>
<th>Browser</th>
<th>Enable notification steps</th>
</tr>
</thead>
</table>
| Chrome                                            | 1. From a Chrome window, click the Chrome menu in the upper right corner.  
2. Go to Settings Show advanced settings... Privacy Content settings .  
3. In the Content settings window, from the notifications section, select your notification settings. |
| Mozilla Firefox (starting with version 44)        | Manage browser notification settings using the information icon next to the URL.                                                                                                                         |
| Safari (starting with OS X Mavericks)              | 1. From a Safari window, open Preferences.  
2. Select the notifications tab.  
3. Select Allow or Deny to control which websites have access to notifications.                                                                 |
### Browser | Enable notification steps
--- | ---
Microsoft Edge | Notifications are enabled by default on Windows 10 PCs and tablets starting with EdgeHTML 14. For more information, see [https://blogs.windows.com/msedgedev/2016/05/16/web-notifications-microsoft-edge/#pVkwubg7uvROayyI.97](https://blogs.windows.com/msedgedev/2016/05/16/web-notifications-microsoft-edge/#pVkwubg7uvROayyI.97).

**Note:** Internet Explorer does not support Connect notifications out of box.

---

**Edit which notifications you receive for a conversation**

You can control which types of Connect notifications you receive for each conversation and when you receive them.

**Role required:** none

Connect can send mobile, desktop, email, and audio notifications to inform you of messages and other activity, when you are not actively viewing Connect. You can edit your notification preferences in each conversation to control which notifications you receive for the conversation and under what circumstances. For example, if you are a member of a large group conversation, you might want to receive mobile, desktop, and email notifications for all activity, and audio notifications only when someone mentions you. You might also want to disable a certain type of notification entirely for a conversation.

By default, you receive mobile, email, and audio notifications for all activity in every conversation you belong to. You must enable desktop notifications manually. Not all browsers allow desktop notifications.

For more information, see [Enable or disable Connect notifications globally](#) on page 478.

An administrator can customize the sound used for audio notifications.

**Note:** You receive mobile notifications only if you have installed the ServiceNow mobile app.

1. Open a conversation in the Connect workspace.
2. In the conversation tools to the right of the conversation, click the notification settings tab ( ).
3. Edit the following settings according to your preferences.

**Note:** If a notification type is disabled globally, a link to enable that type appears. You must click the link before you can edit conversation-specific notification settings.

![DESKTOP NOTIFICATION SETTINGS](#)

*Desktop notifications are currently disabled. Click here to enable desktop notifications globally*

**Figure 96: Notification type disabled globally**
<table>
<thead>
<tr>
<th>Mobile Notification Settings</th>
<th>Choose to receive push notifications:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• For all activity</td>
</tr>
<tr>
<td></td>
<td>• Only when @ mentioned (this option is not available for direct conversations)</td>
</tr>
<tr>
<td></td>
<td>• Never</td>
</tr>
<tr>
<td>Desktop Notification Settings</td>
<td>Choose to receive desktop notifications:</td>
</tr>
<tr>
<td></td>
<td>• For all activity</td>
</tr>
<tr>
<td></td>
<td>• Only when @ mentioned (this option is not available for direct conversations)</td>
</tr>
<tr>
<td></td>
<td>• Never</td>
</tr>
<tr>
<td>Email Settings</td>
<td>Choose to receive email notifications:</td>
</tr>
<tr>
<td></td>
<td>• For all activity</td>
</tr>
<tr>
<td></td>
<td>• Only when @ mentioned (this option is not available for direct conversations)</td>
</tr>
<tr>
<td></td>
<td>• Never</td>
</tr>
<tr>
<td>Audio Notification Settings</td>
<td>Choose to receive audio notifications:</td>
</tr>
<tr>
<td></td>
<td>• For all activity</td>
</tr>
<tr>
<td></td>
<td>• Only when @ mentioned (this option is not available for direct conversations)</td>
</tr>
<tr>
<td></td>
<td>• Never</td>
</tr>
<tr>
<td>System Message Notifications</td>
<td>Enable or disable system message notifications,</td>
</tr>
<tr>
<td></td>
<td>which are automatically generated by events like</td>
</tr>
<tr>
<td></td>
<td>conversation membership changes and Visual Task Board</td>
</tr>
<tr>
<td></td>
<td>updates. This option is not available for direct</td>
</tr>
<tr>
<td></td>
<td>conversations.</td>
</tr>
</tbody>
</table>

**Upload a profile picture**

You can upload a profile picture in your Live Feed profile to use as an avatar in Connect Chat and Connect Support conversations.

Role required: none

Users who do not have profile pictures are represented by an avatar with their initials. Administrators can upload a profile picture in a user record which displays if there is no Live Feed photo.

1. Navigate to Collaborate Live Feed.
2. Click the tile with your picture or initials and title.
3. Use one of the following actions to add your photo.
   • Locate the photo file you want to use and drag it over the existing photo.
   • Point to the existing picture (or tap the photo in the smartphone or tablet interface) to display the
     Upload a picture link. Click the link, navigate to the location of the photo you want to use, and click
     Open.

Drag a file into a Connect conversation

Drag and drop functionality in Connect Chat and Connect Support provides an easy way to share external
attachments and links or items from within your instance.

Role required: none

You can drag several things from within an instance, including items from the application navigator, records
or breadcrumbs from lists, and Visual Task Boards from the My Task Boards page.

Drag an item in a Connect mini window.

To drag a record from a list, drag the reference icon

( ),

the record number, or a reference column value.

Connect accepts the same file extensions as the platform. For more information, see Add and manage
attachments.
Share a Visual Task Board in a Connect conversation

You can share a Visual Task Board in a Connect Chat or Connect Support conversation.

Role required: none

2. Drag a task board to a Connect mini window.
   A link to the task board appears in the conversation. The task board is also listed in the conversation tools, which are visible in the Connect workspace. Only conversation members who are members of the board can access it. If you share a task board in a record conversation, it appears as a URL in the record activity stream.

Mention a user in a Connect conversation

You can get someone's attention in a group conversation by mentioning them.

Role required: none

Users can set their notification preferences so they receive notifications only when they are mentioned. Mentioning a user creates a shortcut to view their basic information and send them a direct message.

1. Open a Connect group conversation.
2. In the message field, type the @ character.
   A suggestion menu appears with the names of the conversation members.
3. Select the person you want to mention and send the message.

Connect administration

Administrators can configure various performance settings and features that impact both Connect Chat and Connect Support.

Note: There are also administrative options specifically for Connect Chat or Connect Support.
For more information, see Connect Chat administration on page 496 and Connect Support administration on page 508.

Domain separation in Connect Support and Connect Chat

This an overview of how domain separation works in Connect Support and Connect Chat, and the expected interactions across domains to support multiple tenants. Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.

Overview

Support: Level 1

Domain separation is supported in this application. Not all ServiceNow applications support domain separation; some include limitations on the data and administrative settings that can be domain separated. To learn more, see Application support for domain separation.

Connect Support adheres to the standard domain separation patterns within ServiceNow, with some exceptions. Most notably, Connect Support allows for users in a parent or top-level domain to interact with chat_queue_entry records generated from child domains. Users can then pose questions in specifically-labeled chat_queues directly to the primary administrators of the instance.

Connect Chat supports data separation within domain separated instances. Delegated administration—the ability to override configuration settings and logic in domains—is not supported.

How domain separation works in Connect Support

Connect Support supports data separation within domain-separated instances. Delegated administration—the ability to override configuration settings and logic in domains—is not supported.

Configuration

Connect Support is configurable by system administrators only. Configuration settings apply to all domains. Overrides for configuration details and process logic in domains are not supported.

After domain separation has been enabled, the following Connect Support-related tables are not domain-separated in the base system:

- chat_queue
- connect_action
Records created from users in a child domain remain in the child domain to both the agent and the user initiating the chat. Any of the following tables represent records that support the conversation.

### Table 97: Records from conversations

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>chat_queue_entry</td>
<td>Holds the initial question from the end user, and other metrics to determine overall support efficiency, such as wait_time.</td>
</tr>
<tr>
<td>live_group_profile</td>
<td>Represents the conversation itself</td>
</tr>
<tr>
<td>live_group_member</td>
<td>Each individual member of the support conversation</td>
</tr>
<tr>
<td>Incident and other task-based records</td>
<td>Any record generated from connect_actions.</td>
</tr>
</tbody>
</table>

### How domain separation works in Connect Chat

Configuration: Connect Chat is configurable by system administrators only. Configuration settings apply to all domains. Overrides for configuration details and process logic in domains are not supported.

Actions may be made available to specific domains based on condition filters set by system administrators.

Data Management: Connect Chat messages are not assigned to a domain. Rather, visibility is restricted to conversation participants.

### Usage scenarios

Chat with users in the same domain (Supported)

- Domain visibility allows users to see other users in the same domain.
- Examples:
  - Service Provider user may chat with another Service Provider user
• ACME user may chat with another ACME user

Parent domain user initiates chat with child domain user (Supported)
• Domain visibility allows users to see users in child domains.
• Examples:
  • Service Provider user may initiate a chat with a Service Provider sub-contractor user
  • ACME user may initiate a chat with ACME EMEA user

Domain user initiates chat with user in a domain where visibility has been granted (Supported)
• Domain visibility allows the user initiating a chat to see users in the target domain.
• Examples:
  • Service Provider sub-contractor user may initiate a chat with an Initech user, given domain visibility
  • Service Provider users may initiate a chat with any domain user, given the contains relationship with the TOP domain

Sub-domain user initiates chat with Parent domain user (Not supported)
• Domain visibility does not allow users in child domains to see users in parent domains. This means they are unable to initiate a chat session.

Configuration

Administrators may configure multiple Chat Queues. Support Queues are not assigned to a domain. Assignment groups may exist in any domain.

Any user with the appropriate link can enter a queue, regardless of the user’s domain. Exposure of links to specific queues through the default user interface may be controlled using domain-specific overrides. Exposure of links to specific queues through the Service Portal may be controlled using conditions or custom coding logic.

The Reporting Dashboard contains statistics related to all queues and all agents. Statistics are not filtered according to domain. Therefore, it is not appropriate to expose this page to users within child domains.

Data management

Connect Support Queues are global. No domain field exists on this table and it is not suitable for domain separation.

Connect Support messages are assigned to a domain based on the domain of the user entering the queue. Members of the Assignment group for the queue must have domain visibility to the user entering the queue to participate in chat sessions.

Records generated from chat sessions display based on the agent’s home domain. However, once the record is saved with a Company value, business rules assign the newly created record to the corresponding domain.
Usage scenarios

In the illustration above:

- The ACME support queue is configured to be available from 8-5 on weekdays. The ACME Support group in the ACME domain provides first-level support. If more advanced support is required, users are escalated to the Service Provider’s Service Desk queue.
- The Service Desk queue is configured to be available 24x7 and is staffed by the Service Desk Group in the Service Provider domain. If more advanced support is required, users are escalated to the Tier 2 Support queue in the same domain.

Properties for Connect

The Connect Properties page provides several configuration options for Connect.

These properties are available for Connect.

Users with the admin role can access these properties by navigating to Collaborate Administration Properties.

**Note:** Many of the properties also impact Connect Support.

<table>
<thead>
<tr>
<th>Table 98: Properties for Connect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Property</strong></td>
</tr>
<tr>
<td>Disable Presence</td>
</tr>
<tr>
<td>glide.ui.presence.disabled</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Property</td>
</tr>
<tr>
<td>----------</td>
</tr>
</tbody>
</table>
| Enable Connect in the frameset | Determines whether the Connect overlay is visible (enabled). This property also impacts Connect Support.  
  - Type: true | false  
  - Default value: true  
  - Location: Collaborate Administration Properties  
  - Learn more: Disable the Connect overlay on page 490 |
| Enable Connect to retrieve external link metadata in order to render richer content in messages with links to YouTube, news articles, images, etc. | Enables Connect to render URLs for external sites as links. When this property is disabled, URLs that point anywhere outside the instance appear as plain text. This property also impacts Connect Support.  
  - Type: true | false  
  - Default value: true  
  - Location: Collaborate Administration Properties |
| Number of minutes to wait before collecting unread messages and sending an email to offline users. | Sets the number of minutes the system waits before sending a Connect notification email to an inactive user.  
  - Type: integer  
  - Default value: 3  
  - Location: Collaborate Administration Properties  
  - Learn more: Configure the email notification interval |
| Audio file to play to notify users of new messages, support conversation transfers and @mentions in Connect. This property's value should point to the 'name' field of an audio file in the db_audio table. | Specifies the audio file to play to notify users of new messages, support conversation transfers, and @mentions in Connect. This property's value must point to the Name field of a record in the Audio File [db_audio] table. This property also impacts Connect Support.  
  - Type: string  
  - Default value: connect_alert.mp3  
  - Location: Collaborate Administration Properties  
  - Learn more: Customize the Connect audio notification sound on page 490 |
<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
</table>
| Comma separated whitelist of roles able access Connect. Empty allows all roles. connect.roles | Determines which user roles are required to access Connect. When the value is blank, no role is required. This property also impacts Connect Support.  
**Note:** If you choose to restrict Connect access to specific roles, consider updating the role requirements for Connect modules and other access points.  
- Type: string  
- Default value: <empty>  
- Location: Collaborate Administration Properties |
| Determine whether or not a button is shown in task forms to view the Collaboration document conversation or Live Feed Record Feed related to the task. Note: The Collaboration button will only be enabled if the frameset view is also enabled with collaboration.frameset = true glide.live_feed.task_header_button | Determines whether the show live feed icon (📢) and Follow button are available in the form header of tables that have the live_feed=true dictionary attribute.  
- Type: choice list  
- Default value: collaboration  
- Other possible values:  
  - both: enables both the show live feed icon and the Follow button.  
  - live_feed: enables the show live feed icon.  
  - none: disables both the show live feed icon and the Follow button.  
- Location: Collaborate Administration Properties  
- Learn more: Configure record conversations |
| Disable the legacy chat "Create or Join Chat Room" link on the Incident form (Must have Chat plugin enabled to see link) glide.connect.enabled | Hides the Create or Join Chat Room related link, which appears on the Incident form when legacy chat is enabled. Legacy chat and Connect Chat should not be used concurrently and this property should not be modified.  
- Type: true | false  
- Default value: true  
- Location: Collaborate Administration Properties |

### Configure the polling interval

The polling interval determines how frequently the system polls for new Connect messages.  
Role required: admin
The default interval is 10 seconds. You can change this value. The shorter the polling interval, the more frequently the system checks for new messages and the greater the impact on performance.

**Note:** This setting impacts Connect Chat and Connect Support.

1. Navigate to sys_properties.list.
2. Locate the collaboration.polling_interval property.
3. Set the Value to a different number of seconds.
   Setting the polling interval to a value smaller than 2 is likely to tax the system too heavily, while a value greater than 10 is likely to result in a poor user experience.

**Disable the Connect overlay**

The Connect overlay is enabled by default and is integrated with the standard user interface. You can disable the Connect overlay.

Role required: admin

To disable the Connect overlay and remove the toggle Connect sidebar icon from the banner frame, set the collaboration.frameset property to false.

1. Navigate to Connect Administration Properties.
2. Locate the property called Enable Connect in the frameset (collaboration.frameset) and clear the check box.
3. Click Save.

When the frameset is disabled, any Connect chats open in the Connect workspace. For more information on completely disabling Connect Chat, see *Disable Connect Chat* on page 499.

**Customize the Connect audio notification sound**

You can replace the default Connect audio notification sound with an audio file of your choice.

*Upload the audio file* you want to use as the notification sound.

Role required: admin

The audio notification sound is used for all Connect conversation types, including Connect Support conversations.

1. Navigate to System UI Audio Files.
2. Locate the audio file you want to use as the notification sound and copy the Name value.
3. Navigate to Connect Administration Properties.
4. Locate the property called Audio file to play to notify users of new messages, support conversation transfers and @mentions in Connect (connect.notification.audio_alert) and replace the default value with the name of the audio file.
5. Click Save.

End users receive audio notifications when sending and receiving support chats. Support agents only receive audio notifications for inbound chats when the chat window is not in focus.

**Administer Connect actions**

You can create or modify Connect actions to provide custom functionality in Connect Chat or Connect Support conversations.
If you want to customize the icon for a Connect action, navigate to Collaborate Administration Action Icons to view the available icons and their class names. Note the class name of the icon you want to use.

Role required: admin

The Connect action menu appears by the message entry field when one or more Connect actions are available for a conversation, based on defined conditions. When a user selects a Connect action, the system runs the script defined for that action.

1. Navigate to Connect Administration Actions.
2. Click New or open an existing Connect action.
3. Complete the Connect Action form, as appropriate.

### Table 99: Connect Action form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition</td>
<td>JavaScript condition statement that must return true for the action to be available in a conversation. For example, to show the action in Connect Support conversations only, enter <code>conversation.type === &quot;support&quot;</code> or <code>conversation.table === 'chat_queue_entry'</code>. For information about the conversation object, see the API reference documentation.</td>
</tr>
<tr>
<td>Hint</td>
<td>This field is not used.</td>
</tr>
<tr>
<td>Icon Class Name</td>
<td>Class name of icon to use. To view all available icons and their class names, navigate to Collaborate Administration Action Icons.</td>
</tr>
<tr>
<td>Order</td>
<td>Order of the action relative to other items in the Connect action menu.</td>
</tr>
<tr>
<td>Script</td>
<td>Script to execute when the action is run. For example, to create a new incident based on the conversation, enter the following code:</td>
</tr>
<tr>
<td></td>
<td>For information about the response object, see the API reference documentation.</td>
</tr>
<tr>
<td>Shortcut</td>
<td>Text that triggers the action when entered after the &quot;/&quot; character in a conversation.</td>
</tr>
</tbody>
</table>

*Note:* You can only create a Connect action based on a task table.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>Text that appears in the Connect action menu. The title for each Connect action should be unique.</td>
</tr>
</tbody>
</table>

**Figure 97: Connect Actions form**

Configure the fields on a record card in Connect

When a record is either linked to or create from a Connect conversation, the details of the record display as a card in the chat window.
The card view only applies to the full Connect page and the end user view of Connect Support conversations.

Role required: admin

1. Navigate to the form you want to configure fields for.
2. Right-click the header and select Configure Form Layout.
3. Under the Form View section, select the Connect view.
   You may need to create a Connect view for the form. For more information on creating a form view, see Create and delete views.
4. Select the fields to appear on the card by adding or removing the fields from the Selected column. You can also adjust the order they appear on the form by moving the fields up or down.
   You cannot remove the Author or the Updated fields from the card regardless of whether they are on the view or not. The card always shows the Short Description field in the top even if it is in a different order in the list.

Disable specific URLs for Connect

Prevent users from accessing certain websites by disabling linking to specific Top-Level Domains (TLDs).

Role required: admin

1. In the navigation filter, type sys_properties.list.
2. Search for the glide.ui.url.external.top_level_domains system property.
3. In the value field, remove any TLDs that you do not want your users to have access to. For example, remove any TLDs that are commonly used for restricted websites, such as xxx or adult.
   The list of TLDs is based on the top 200 most common domains.

Any TLD not included in the value field becomes unclickable in Connect.

Connect Chat

Connect Chat is a real-time messaging tool that enables users to chat with individuals and groups, quickly share files, and collaborate on any record by connecting with the right people instantly.

Connect Chat animates communication around records, Visual Task Boards, topics of interest, or groups of people.

Features include:

• Direct conversations between two users.
• Group conversations between three or more users.
• Conversations linked to records. Comments and work notes appear in conversations in real time and users can update the record directly from the conversation.
• Drag-and-drop sharing of links, files, and records.

UI16 or UI15 is required to use Connect Chat.

This video demonstrates how to use Connect Chat.
This video demonstrates how to use Connect Support.

Note:
• Connect Chat does not replace legacy chat but offers some of the same functionality. The features should not be used concurrently.

---

**Connect Chat use**

All users have access to Connect Chat, a convenient way to stay updated on all the people and documents you work with in a familiar chat interface.

You can start using Connect Chat right away with virtually no setup. Connect Chat supports a few different types of conversations so you can use it as a social tool or a quick way to follow specific records.

**Start a direct or group conversation**

You can start a conversation with one or more users in Connect Chat.

*Role required: none*

A conversation between two users is called a direct conversation. A conversation between three or more users is called a group conversation.

1. In the chat view of the Connect sidebar, click the plus icon (+) by the filter. A Connect mini window appears.
2. In the To field, enter the name of the user you want to chat with. Suggestions appear as you type.
3. Enter additional names to create a group conversation. You can add or remove group conversation members later. You cannot add members to a direct conversation after you create it.
4. Press the Enter key to shift focus to the message field.
5. Send a message to create the conversation. The conversation is added to the Connect sidebar for quick access.

**Follow a record in Connect**

You can follow a record in Connect Chat to track activity as it happens, in a familiar chat interface. When you follow a record, you become a member of a record conversation.

*Role required: whichever role is required to access the record you want to follow in Connect*

Any record conversation you create in Connect becomes a record feed in live feed, and vice versa. Unlike direct or group conversations, all messages in record conversations are comments or work notes.

---

**Note:** By default, record conversations are enabled for all tables that extend Task [task]. Administrators can enable record conversations for additional tables or disable them if desired.

1. Navigate to a task record.
2. Do one of the following actions.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Follow the record</strong></td>
<td>1. In the form header, click Follow. The system adds you as a member of the record conversation, but does not open the conversation. You can open the conversation from the Connect sidebar.</td>
</tr>
<tr>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| **Follow the record and open a chat mini window** | 1. In the form header, click the down arrow in the Follow button.  
2. Select Open Connect Mini.  
The system adds you as a member of the record conversation and opens it in a Connect mini window. |
| **Follow the record and open the Connect workspace** | 1. In the form header, click the down arrow in the Follow button.  
2. Select Open Connect Full.  
The system adds you as a member of the record conversation and opens it in the Connect workspace, the full-screen view. |

The Follow button is relabeled Following.

3. **Add comments or work notes to the record directly from Connect.**
   Any comments or work notes added to the record appear in the record conversation. Likewise, comments and work notes you add to the conversation appear on the record.
   a) In the record conversation, by the text entry field, click the message type icon.

   ![Message type icon](image.png)

   b) Select Comment or Work Note.
   c) Enter a message.

   By default, record conversation messages are added as work notes.

   **Note:** If you add an attachment to a record conversation, it is attached to the underlying record as well.

    *Edit your notification settings* for the record conversation.

**Edit basic conversation details**

In Connect Chat, you can customize the avatar, name, and description for a group or record conversation.

Role required: none

These details are not editable for direct conversations.

   **Note:** The name and description for a record conversation default to the record name and short description. However, editing the name or description for a record conversation does not change anything on the underlying record.

1. Open the a group or record conversation in the Connect workspace.
2. Click anywhere in the conversation header to the left of the icons. A pop-up appears to edit conversation details.
3. Edit the conversation image, name, and description as needed.
4. Click Save.

Add or remove conversation members

In Connect Chat, any member of a group or record conversation can add or remove other conversation members. In a direct conversation with only two people, you cannot add members to the conversation after you create it.

Role required: none

1. Open a group or record conversation in the Connect workspace.
2. In the conversation tools to the right of the conversation pane, click the member list tab

3. Do one of the following actions.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
</table>
| Add a member   | 1. Click Add Member to Group.  
                | 2. Use the search field to find and select a user. |
| Remove a member| 1. Point to a member name.  
               | 2. Click the minus icon (-). |

Create a Connect conversation from a Visual Task Board

Create a Connect Chat conversation from a Visual Task Board to collaborate with board members and keep track of activity as it happens.

Role required: none

When you create a conversation from a task board, all the board members become members of the conversation. The members are synchronized between the task board and the conversation. For example, if you remove a user from the conversation, the system automatically removes the user from the board as well.

2. Open a task board.
3. In the board header, click the connect with board members icon.
   The system automatically opens a record conversation for the board. Each board member becomes a member of the conversation.

Connect Chat administration

Administrators can configure various performance settings and features of Connect Chat.

Note: There are also settings that apply to both Connect Chat and Connect Support. For more information, see Connect administration on page 484.
Configure the email notification interval

The email notification interval determines how long the system waits before sending a Connect Chat email notification to an inactive user.

Role required: admin

The default interval is 3 minutes. You can change this value.

1. Navigate to Connect Administration Properties.
2. Locate the property called Number of minutes to wait before collecting unread messages and sending an email to offline users. (collaboration.email_interval) and set the value to a different number of minutes.
3. Click Save.

When an offline user is sent a Connect message, the collaboration.new_offline_message event fires. The system waits the amount of time provided in the collaboration.email_interval property, then triggers the collaboration.notify_offline_user and collaboration.notify_offline_user.group events (depending on if the conversation was peer to peer or a group conversation). The sysevent_email_action record listens for collaboration.notify_offline_user(.group) then builds an email notification containing all the messages from the last collaboration.email_interval minutes that the user has received in that conversation.

Enable record conversations for a table

Record conversations are enabled for all tables that extend Task [task] by default. You can configure record conversations for additional tables that extend Task.

Role required: admin

To create record conversations, users must have access to the Follow button in the form header. To show the button and thus enable record conversations for a table, the following conditions must be true.

- The live_feed dictionary attribute must be set to true for the table.
  - By default, live_feed=true for all tables that extend Task [task].
- The glide.live_feed.task_header_button property must be set to both or collaboration.
  - By default, glide.live_feed.task_header_button is set to collaboration.

1. Navigate to the list view of a table for which you want to enable record conversations.
2. Perform the appropriate action for the list version.

<table>
<thead>
<tr>
<th>Version</th>
<th>Action</th>
</tr>
</thead>
</table>
| List v3   | 1. Click the list title menu and select Configure.  
2. In the Configure window, click Dictionary. |
| List v2   | Right-click any column header and select Configure Dictionary. |

The list of dictionary entries for the table appears.

3. Open the dictionary entry that has Type set to Collection.
   The Dictionary Entry form appears.
4. In the Attributes related list, click New.
   The Dictionary Attribute form appears.
5. In the Attribute field, enter Live feed.
6. In the Value field, enter true.
7. Click Submit.
8. Navigate to Collaborate Administration Properties.
9. Locate the property called Determine whether or not a button is shown in task forms to view the Collaboration document conversation or Live Feed Record Feed related to the task (glide.live_feed.task_header_button).
10. Ensure the property is set to both or collaboration.

The glide.live_feed.task_header_button property also controls whether the show live feed icon ( ) appears. If the property is set to collaboration, the show live feed icon does not appear on form headers.

Prevent users from following records in Connect for all tables

Users can follow records in Connect for any table that extends Task [task] by default. You can disable this functionality for all tables.

Role required: admin

To disable record conversations for all tables, prevent the Follow button from appearing in all form headers by editing the glide.live_feed.task_header_button property.

1. Navigate to sys_properties.list.
2. Locate the glide.live_feed.task_header_button property.
3. Set the Value to live_feed.

Prevent users from following records in Connect for a specific table

Users can follow records in Connect for any table that extends Task [task] by default. You can disable this functionality for a specific table.

Role required: admin

To disable record conversations for a specific table, prevent the Follow button from appearing in form headers for the table. To do so, set the live_feed dictionary attribute to false for the table.

1. Navigate to the list view of a table for which you want to disable record conversations.
2. Perform the appropriate action for the list version.

<table>
<thead>
<tr>
<th>Version</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>List v2</td>
<td>Right-click any column header and select Configure Dictionary.</td>
</tr>
<tr>
<td>List v3</td>
<td>Open the list title menu and select Configure, and then select Dictionary.</td>
</tr>
</tbody>
</table>

The list of dictionary entries for the table appears.

3. Open the dictionary entry that has Type set to Collection.
The Dictionary Entry form appears.
4. In the Attributes related list, locate the Live feed dictionary attribute.
5. Set the Value to false.
Setting the dictionary attribute to false also removes the show live feed icon ( ) for the table.
Disable Connect Chat

You can disable Connect Chat to prevent users from being able to chat within the platform.

Role required: admin

Disabling Connect Chat hides the Connect Chat sidebar icon. Users who try to access Connect Chat from the navigation pane receive a message that says Connect has been disabled.

1. In the navigation filter, type sys_properties.list and press Enter.
2. Search for the glide.connect.chat.disabled property.
3. Set the property value to true.

Connect Support

Connect Support is a real-time messaging tool that enables support agents to easily keep track of their support cases, quickly find solutions, and resolve problems quickly.

Connect Support builds on the messaging platform provided with Connect. For general information about the Connect interface, setup, and administration, see Connect on page 460. When Connect Support is enabled, users designated as support agents have access to the support tab of the Connect sidebar.

Using Connect Support:

- Administrators can create chat queues and enable users to access live support.
- Support agents can monitor the queues to provide instant support.
- Users can share links, files, and records using drag-and-drop.

UI16 or UI15 is required to use Connect Support.

**Note:**
- Connect Support does not replace legacy chat but offers some of the same functionality. Do not use the features concurrently.

Monitor incoming Connect Support conversations

In the support tab of the Connect sidebar, you can monitor the queues for which you are an agent and accept incoming conversations.

Role required: none

**Note:** The support tab is visible only if you are an agent for one or more queues.

1. Navigate to Collaborate Connect Support.
   The Connect workspace opens in a new tab.
2. Click the support tab of the Connect sidebar, indicated by a headset icon (イヤホンのアイコン).
   The support tab displays Queues to which you belong. It also displays your open support conversations under Cases. When a user starts a support conversation or an agent transfers a conversation to a queue, any agent who belongs to the associated queue can accept the conversation. An agent can also request to transfer a conversation directly to you.
3. Accept a conversation in one of the following ways.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accept a conversation from a queue</td>
<td>Under Queues, click Accept by the queue. The conversation opens in the conversation pane and an entry appears in the Cases section of the sidebar.</td>
</tr>
<tr>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Accept a transfer request</td>
<td>Under Cases, click Accept by a transfer request.</td>
</tr>
</tbody>
</table>

![Figure 99: Transfer request](image)

The conversation opens in the conversation pane. The agent who transferred the conversation can stay in the conversation.  

4. Respond to the user and help resolve the issue.  
   By default, your messages are added to the conversation record as comments and are visible to the user.

**Share knowledge in a Connect Support conversation**

The support view of the Connect workspace has a built-in knowledge tool that makes it easy to search for knowledge articles and share them in a conversation.  

Role required: none

Use the knowledge tool to research user questions and provide solutions quickly and easily.  

1. Open a support conversation in the Connect workspace.  
   The knowledge tool is not available in Connect mini windows.

2. In the conversation tools area to the right of the conversation pane, click the knowledge base tab, which is represented by an open book icon.

The knowledge homepage appears in the conversation tools pane.
3. Search for articles related to the user's issue.
   For more information about finding knowledge, see Knowledge search on page 1382.

4. To share an article in the conversation, drag a knowledge article link to the conversation pane and drop it anywhere in the drop zone that appears.

Transfer a Connect Support conversation to a different agent or queue

You can transfer a Connect Support conversation to a different agent in the queue or to a different queue.

Role required: none

1. Open a Connect Support conversation.

2. At the bottom of the conversation, click the menu icon (≡) to open the Connect actions menu.
3. In the Connect actions menu, select Transfer. A transfer dialog box opens.

4. Do one of the following actions.
<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Transfer the conversation to an agent** | 1. To start the transfer request, click Transfer by an agent's name.  
Be sure to choose an agent who is online. A green dot on their avatar indicates that a user is online.  
You can cancel the transfer any time before it is accepted.  

| Case | Joe Employee, HR Depart…  
Pending Transfer  
10:19 | Cancel |
|------|---------------------------|--------|

2. When the transfer is accepted, select one of the following options in the dialog box that appears.  
• Stay: Remain in the conversation, which is also known as a warm transfer. This option is ideal if you want to provide the new agent with background information or introduce the user to the new agent.  
• Leave: Exit the conversation, which is also known as a cold transfer.  

| **Transfer the conversation to a queue** | Click Transfer by a queue.  
The system automatically removes you from the conversation and the conversation enters the queue you selected. |

Add a user to a Connect Support conversation  
You can add additional users to a Connect Support conversation.  
An administrator must enable the glide.connect.support.add_members property before users can be added to conversations.  
Role required: none  
1. Open a group or record conversation in the Connect workspace.
2. In the conversation tools to the right of the conversation pane, click the member list tab.

3. Do one of the following actions.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add a member</td>
<td>1. Click Add Member to Group.</td>
</tr>
<tr>
<td></td>
<td>2. Use the search field to find and select a user.</td>
</tr>
<tr>
<td>Remove a member</td>
<td>1. Point to a member name.</td>
</tr>
<tr>
<td></td>
<td>2. Click the minus icon ( - ).</td>
</tr>
</tbody>
</table>

The assigned support agent cannot be removed from a Connect Support conversation.

Note: Only the assigned support agent can create an incident from the Connect Support conversation.

---

**Escalate a Connect Support conversation**

If an escalation path is defined for a Connect Support conversation, you can use a shortcut to escalate a Connect Support conversation to a different queue.

Define an escalation path for the queue, using the Escalate field on the Chat Queue [chat_queue] table. For more information, see *Administer Connect Support queues* on page 510.

1. Open a Connect Support conversation.
2. At the bottom of the conversation, click the menu icon ( ) to open the Connect actions menu.
3. In the Connect actions menu, select Escalate.
   A confirmation dialog box appears.
4. In the dialog box, click Escalate.
   The system automatically removes you from the conversation and the conversation enters the escalated queue.

---

**Create an incident from a Connect Support conversation**

You can use a shortcut to create an incident on behalf of a user, directly from a Connect Support conversation.

Role required: none

You might want to create an incident if you cannot resolve the user's issue over chat or if you want to create a record of the conversation to share with the user. When you create an incident from a support conversation, the system copies the conversation history to the incident activity stream as comments and work notes. Future messages are tracked in the incident as well.
1. Open a Connect Support conversation.

2. At the bottom of the conversation, click the menu icon (≡) to open the Connect actions menu.

3. In the Connect actions menu, select Create Incident.
   In the conversation tools area to the right of the conversation, a new incident form opens in a record tab. The system automatically sets the Caller field to the user who opened the support conversation.

4. Complete the form as necessary and click Submit.
   Any comments or work notes in the record conversation appear as comments on the incident form. Work notes do not appear in the chat for the ESS user. The chat agent can select whether a message is a Comment or Work Note in the conversation.
   a) In the record conversation, by the text entry field, click the message type icon
      ( ).
   b) Select Comment or Work Note.
   c) Enter a message.

By default, record conversation messages are added as comments.

Note: If you add an attachment to a record conversation, it is attached to the underlying record as well.

The system automatically shares the record in the conversation, copies the conversation to the record activity stream, and references the record on the Chat Queue Entry [chat_queue_entry] table. Any new journal fields added to the record do not appear in the chat. The system also changes the document ID for the conversation to reference the incident number instead of the entry in the Chat Queue Entry table.

Connect Support chat states

Connect Support chats move through specific states.
Figure 100: Connect Support states diagram
Table 100: Connect Support chat states

<table>
<thead>
<tr>
<th>State</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waiting</td>
<td>• Requestor/end user entered a queue by sending a message. Agent did not accept it yet.</td>
</tr>
<tr>
<td></td>
<td>• End user rejoins a session before agent closes it</td>
</tr>
<tr>
<td>Work in Progress</td>
<td>• Agent accepts a chat from a queue. Both requester and agent</td>
</tr>
<tr>
<td></td>
<td>• Requestor/client leaves an ongoing conversation (session times out, loss of connectivity); agent does not end a session; requester rejoins</td>
</tr>
<tr>
<td>Closed Abandoned</td>
<td>Requestor/client leaves a conversation before agents accepts it</td>
</tr>
<tr>
<td>Closed Escalated</td>
<td>Agents escalated an ongoing conversation by performing Escalate action from a hamburger menu.</td>
</tr>
<tr>
<td>Closed Complete</td>
<td>• Agent leaves/closes an ongoing conversation with a requestor/client</td>
</tr>
<tr>
<td></td>
<td>• End user times out</td>
</tr>
<tr>
<td></td>
<td>• End user ends their session</td>
</tr>
</tbody>
</table>

Connect Support administration

Administrators can configure various performance settings and features of Connect Support.

**Note:** There are also settings that apply to both Connect Chat and Connect Support. For more information, see [Connect administration](#) on page 484.

Migrate from legacy chat to Connect Support

Connect Support is an extension of Connect. Users designated as support agents have access to the support tab of the connect sidebar. Do not use Connect Support concurrently with legacy chat.

Before you activate Connect Support, inform your support agents to close out any existing chats.

Legacy chat uses a different field to determine which state a help desk chat is in. A fix script is included in the Connect Support plugin that circumvents this issue by closing out any existing help desk chat sessions. Manually closing out any existing chats before allowing this script to run helps prevent any loss of chat information.

If you do not close out existing help desk chats, your metrics and chat queue will not work accurately.

1. Activate the Connect Support plugin.
   When you activate the Connect Support plugin, the glide.connect.support.enabled property redirects the legacy chat URL to Connect Support.
   For more information, see [Activate Connect Support](#) on page 464.

2. Hide the Social IT application.
   Activating Connect Support does not completely eliminate the legacy chat module. To prevent users from using the legacy chat, hide the Social IT application menu. For more information, see [Enable or disable an application menu or module](#).

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Properties for Connect Support

The Connect Support Properties page provides several configuration options specifically for Connect Support.

These properties are available for Connect Support.

Table 101: Properties for Connect Support

Users with the admin role can access these properties by navigating to Collaborate Support Administration Properties.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
</table>
| Should Connect be used for handling chat queue entries glide.connect.support.enabled | Disables or enables Connect Support. When the property is enabled, the Service Desk Chat button in the Employee Self-Service portal opens the conversation in Connect Support, rather than legacy chat. Additionally, the Support tab appears in the Connect sidebar.  
  • Type: true | false  
  • Default value: true  
  • Location: Collaborate Support Administration Properties |
| Number of support conversations an individual agent can have at one time (-1 is unlimited) connect.support.conversation_limit | Determines how many support conversations an individual agent can have at one time. When the value is set to -1, an agent can participate in an unlimited number of conversations.  
  • Type: integer  
  • Default value: -1  
  • Location: Collaborate Support Administration Properties |
| Show agent avatar in Connect Support conversations. connect.support.show_agent_avatar | Determines whether an agent's avatar is shown in a support conversation (enabled). When the property is disabled, users see the agent's name only.  
  • Type: true | false  
  • Default value: true  
  • Location: Collaborate Support Administration Properties |
<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of seconds to wait (without user interaction), before presenting end users with an idle countdown timer connect.support.idle.delay</td>
<td>Determines how many seconds a user must be inactive in a support conversation before an idle countdown timer appears.</td>
</tr>
<tr>
<td>Number of seconds to count down from before marking end user as having left their support session connect.support.idle.count_down</td>
<td>Determines how many seconds the idle countdown timer remains open after it appears. If the idle user does not dismiss the timer before the countdown completes, the system closes the support session.</td>
</tr>
<tr>
<td>Limits the number of closed conversations that the support user can see. (0 = unlimited) connect.support.user.closed.conversation_limit</td>
<td>Determines how many closed conversations appear in a user’s support conversation history. When the value is set to 0, all previous conversations appear in the history.</td>
</tr>
</tbody>
</table>

**Administer Connect Support queues**

You can define the support agents, default messages, schedule, and escalation path for each Connect Support queue.

Role required: admin

**Note:** Both Connect Support queues and legacy chat queues are stored on the Chat Queue [chat_queue] table. Do not use Connect and legacy chat concurrently.

1. Navigate to Connect Queues.
2. Click New or open an existing queue from the list.
3. Complete the Chat Queue form, as appropriate.

**Table 102: Chat Queue form**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the queue.</td>
</tr>
<tr>
<td>Active</td>
<td>Not used in Connect.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Assignment group</td>
<td>User group that contains the support staff for the queue. Any user in the group can view the queue in the Connect sidebar and accept chats. No other users can access the queue. This field must be populated.</td>
</tr>
<tr>
<td>Average wait time</td>
<td>Average time it takes for an agent to accept a chat in the queue. This value is automatically calculated. Do not manually edit.</td>
</tr>
<tr>
<td>Confirm problem</td>
<td>Not used in Connect.</td>
</tr>
<tr>
<td>Escalate to</td>
<td>Different queue to which an agent can escalate a chat. For example, there is a queue for high priority support chats. When a queue is defined in this field, agents can access the Escalate option in conversations.</td>
</tr>
<tr>
<td>Initial agent response</td>
<td>Message that users see when an agent accepts their chat. For example, Thank you for contacting support. We are looking into your question now and will be with you shortly.</td>
</tr>
<tr>
<td>Not available</td>
<td>Message that users see when they attempt to start a chat outside the defined queue Schedule. You can use HTML to format the message and include links or media.</td>
</tr>
<tr>
<td>Question</td>
<td>Initial phrase that users see when they start a new chat in the queue. For example, How can I help you?</td>
</tr>
<tr>
<td>Schedule</td>
<td>Schedule that defines when the queue is available. Leave the field blank to make the queue available all the time. Users cannot start a new conversation in the queue outside the schedule hours.</td>
</tr>
</tbody>
</table>

4. To review conversations associated with the queue, add the Chat Queue Entries related list and review the records for the following information.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>How long the user waited and the result</td>
<td>Review information in the State and Wait time columns.</td>
</tr>
<tr>
<td>Who is actively helping employees in the queue</td>
<td>Review the names of agents in the Assigned to column.</td>
</tr>
</tbody>
</table>

Make a Connect Support queue accessible to end users

To make a Connect Support queue accessible to end users, use the accepted URL format.

Create a queue. Create agents for the queue by assigning users to the assignment group associated with the queue.

Role required: admin
For example, you might create a module or add a link to a portal. The accepted URL format is https://<instancename>.service-now.com/$chat_support.do?queueID=<sys_id>.

1. Navigate to Connect Administration Queues.
2. Right-click the name of the queue to which you want to link.
3. In the context menu, select Copy sys_id. Follow browser instructions to copy the sys_id if browser security measures restrict this function.
4. Preview the support queue by navigating to https://<instancename>.service-now.com/$chat_support.do?queueID=<sys_id>.
5. Create a module or other link to the queue using the URL.

Connect Support metrics

Optional plugins provide a homepage and Performance Analytics dashboards, which contain helpful Connect Support metrics.

The reporting homepage is ideal for support managers who want a simple solution to track the recent performance of the support organization. The Performance Analytics dashboards provide a more full-featured solution for support managers who want to analyze trends over time.

Users with the admin role can activate the following plugins to use these features.

Table 103: Connect Support homepage and dashboard plugins

<table>
<thead>
<tr>
<th>Plugin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connect Support Manager's Dashboard</td>
<td>Provides a homepage for Connect Support, and all required configuration records. Though the plugin name contains the term dashboard, the plugin does not provide functionality related to Performance Analytics dashboards. Homepages are similar to dashboards, but do not require Performance Analytics roles to view.</td>
</tr>
<tr>
<td>[com.glide.connect.managers_dashboard]</td>
<td></td>
</tr>
<tr>
<td>Performance Analytics - Content Pack - Service Desk Chat</td>
<td>Provides the Service Desk Chat Monitor dashboard, which analyzes key Connect Support metrics and indicators.</td>
</tr>
<tr>
<td>[com.snc.pa.chat]</td>
<td></td>
</tr>
<tr>
<td>Performance Analytics - Context Sensitive Analytics for Chat</td>
<td>Provides in-form analytics for Connect Support. These analytics are available as a related link on the Chat Queue Entry [chat_queue_entry] form, and also as the Context Sensitive Analytics - Chat dashboard.</td>
</tr>
<tr>
<td>[com.snc.pa.chat.context_sensitive_analytics]</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** For more information about these plugins, including which other plugins they activate, see Additional plugins for Connect Support on page 466.

Use the Connect Support homepage

Use the Connect Support homepage to view key indicators and metrics related to support conversations, queues, and agents.

Activate the Connect Support Manager's Dashboard plugin (com.glide.connect.managers_dashboard) to view this homepage.

Role required: chat_admin
The homepage is called Service Desk - Chat.

1. Navigate to Connect Support Administration Reporting Dashboard.

   **Note:** Though the module name contains the term dashboard, the module does not provide functionality related to Performance Analytics dashboards. Homepages are similar to dashboards, but do not require Performance Analytics roles to view.

The Connect Support homepage, which is called Service Desk - Chat, opens.

2. Click a widget to drill down into its data.

*Use the Connect Support dashboards*

Use the Connect Support dashboards in Performance Analytics to understand trends in your support organization's performance over time.

Activate one or both of the following plugins, according to your analytics needs:

- Performance Analytics - Content Pack - Service Desk Chat (com.snc.pa.chat)
- Performance Analytics - Context Sensitive Analytics for Chat (com.snc.pa.chat.context_sensitive_analytics)

Role required: both chat_admin and pa_viewer

The Performance Analytics - Content Pack - Service Desk Chat plugin (com.snc.pa.chat) includes the Service Desk Chat Monitor dashboard, which contains the following tabs:

- Chat Monitor By State: Contains metrics related to closed support conversations.
- Overview: Contains several metrics related to support conversations, queues, and agents.
- KPI Process: Contains metrics that are key performance indicators (KPIs) of the Connect Support process, including the average queue response time, the average duration of support conversations, and the number of new support conversations per day.

The Performance Analytics - Context Sensitive Analytics for Chat plugin (com.snc.pa.chat.context_sensitive_analytics) includes the Context Sensitive Analytics - Chat dashboard. The dashboard contains additional metrics related to support queues, including the number of support conversations closed.

   **Note:** You must license Performance Analytics to collect scores for the indicators on the dashboards. Without Performance Analytics premium, the dashboards display the indicators with no data.

1. Navigate to Performance Analytics Dashboards.

   The last dashboard you viewed opens.

2. In the dashboard picker, under the Connect Chat group, select the dashboard you want to view.

3. View the indicators.

*Configure the add support users property*

To enable support agents to add users to a Connect Support conversation, add the glide.connect.support.add_members property.

Role required: admin

When the glide.connect.support.add_members property is added and enabled, support agents can add users to a support conversation. Any added user can also add other users. Only the assigned agent can create an incident from the chat. When non-support agents are added to a chat, the chat appears in their chat tab.
Note: Make sure you are in the Global scope when adding this property.

1. Enter sys_properties.list in the navigation filter.
The entire list of properties in the System Properties [sys_properties] table appears.
2. Verify that the property does not exist by searching for the property name. If it does exist, update the property with the information in the following table.
3. Click New.
4. Complete the form as follows:

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>glide.connect.support.add_members</td>
</tr>
<tr>
<td>Type</td>
<td>true</td>
</tr>
<tr>
<td>Value</td>
<td>true</td>
</tr>
</tbody>
</table>

Out-of-the-box Service Desk Chat Performance Analytics Solutions

Performance Analytics Solutions contain preconfigured best practice dashboards. These dashboards contain actionable data visualizations that help you improve your business processes and practices.

Note: You can activate Performance Analytics solutions and in-form analytics on instances that have not licensed Performance Analytics to evaluate the functionality. However, to start collecting data you must license Performance Analytics.

Performance Analytics Solutions

Use the Performance Analytics widgets on the dashboard to visualize data over time, analyze your business processes, and identify areas of improvement. With solutions, you can get value from Performance Analytics for your application with minimal setup.

Note: Solutions include some dashboards that are inactive by default. You can activate these dashboards to make them visible to end users according to your business needs.

To enable the solution for Service Desk Chat, an admin can navigate to Performance Analytics Guided Setup. Click Get Started then scroll to the section for Service Desk Chat. The guided setup takes you through the entire setup and configuration process.

Connect Support and Service Portal

Use Connect Support in your portal to allow your users to ask questions or submit requests to support agents. You configure the instance options to control the appearance of your widget and how it functions. The Connect Support and Service Portal integration creates a Connect Support widget that you can add to a page in the Service Portal.

Activate Connect Support for Service Portal

Activate the Connect Support and Service Portal integration plugin so you can add the Connect Support widget to a portal page.

Role required: admin
Activating the Connect Support and Service Portal integration plugin automatically activates the Connect Support plugin.

1. Navigate to System Definition Plugins.
2. Search for and activate the Connect Support and Service Portal integration plugin [com.glide.connect.support.service-portal].

After activating the plugin, the Connect Support widget appears in the list of widgets under Service Portal Widgets. Use Connect Support in a portal by adding the widget to any page within the portal. For more information on adding a widget to a page, see Create and edit a page using the Service Portal Designer on page 2668.

![Figure 101: Connect Support widget](image)

Configure Connect Support widget instance options

You can control the appearance of your widget and how it functions by configuring the instance options.

Role required: admin

1. Navigate to Service Portal Service Portal Configuration and open the Service Portal Designer.
2. From the Service Portal Designer, select the page you added the Connect Support widget to. If you have not yet added the widget to a page, see Create and edit a page using the Service Portal Designer on page 2668 for more information.
3. Click the edit icon in the corner of the widget to open the instance options menu.
4. Complete the fields using the following table. Depending on the functionality you want to add, you may not need to add all these fields. For example, if you include the Queue ID, you do not also need to include the Queue Name or the Queue URL.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bootstrap color</td>
<td>Select a color for your widget from a list of common bootstrap colors. Themes control the overall color of a widget, but if you want your widget to be a specific color, you can select it from the list.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Queue URL</td>
<td>The URL for the Connect Support chat queue that you want questions to be directed to. For example, https://&lt;instancename.service-now.com/$chat_support.do?queueID=&lt;sys_id&gt;</td>
</tr>
<tr>
<td>Queue Name</td>
<td>The name of the queue you want the questions to be directed to. You can find a list of queue names in Collaborate Connect Support Queues.</td>
</tr>
<tr>
<td>Queue ID</td>
<td>The sys_id of the queue you want questions to be directed to. You can find this ID by going to the support queue and either copying the queue ID from the support link, or by selecting Copy sys_id from the context menu.</td>
</tr>
<tr>
<td>Message</td>
<td>The text for the button in the Connect Support widget</td>
</tr>
<tr>
<td>Window</td>
<td>Use this option to open the chat in another tab rather than in a new window.</td>
</tr>
<tr>
<td>Title</td>
<td>The name in the widget header</td>
</tr>
</tbody>
</table>

Live Feed

Live Feed is a social IT application that provides a place to post and share content in a ServiceNow instance.

Live Feed content forms a searchable knowledge source for sharing information within an organization. Main features include the following:

- Users can post, reply to, and rate messages, including links and images.
- Administrators can set up automatic messages that are generated when specific records are updated throughout the system.
- Users can subscribe to receive email notifications when new messages are posted.
- Users who take advantage of the accessibility options in the platform can tab through a live feed to navigate.

Live feed includes different types of feeds.
Live feed can be domain separated at the data level only. For more information on live feed and domain separation, see Domain separation in Live Feed on page 530.

Live Feed browser support

The Live Feed v2 plugin does not support Internet Explorer 7 through 9. Users who access the instance from those browser versions can use Live Feed v1 functionality. Users who access the instance from browsers that are compatible with HTML5 can use Live Feed v2 functionality.

Activate Live Feed

Live Feed is active for all instances. An administrator can activate the Live Feed plugin if it is not already active.

1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.
   If the plugin depends on other plugins, these plugins are listed along with their activation status.
   If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).
4. If available, select the Load demo data check box.
   Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.
   You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.
5. Click Activate.

Administer live feed

Administrators and users with the live_feed_admin role can configure live feed security and provide access to live feed from content management pages. Administrators can also set up live feed table notifications.

Document feeds

A document feed is a live feed group that is associated with a record, such as an incident or change. Document feeds allow users to work on tasks and other records through the live feed interface. Users can post messages in live feed that are automatically maintained as comments or work notes on the record, if the record has these journal fields.

The benefits of using document feeds include the following.

- Improving communication between users working on the same record.
- Improving visibility into progress for end users.
- Providing a single place to see updates on multiple records.
• Saving conversation history in the record so that knowledge is not lost in an email chain.

To use document feeds, activate the Live Feed Document plugin, which is active by default in new instances. See Use live feed to work on records on page 556 to learn how to use this feature.

The system automatically creates a document group for the feed when a user follows or shows a record on live feed. The system also creates a document group when a user creates a new record on a table that has live feed enabled.

The following list describes features of the document feed group.
• Is unlisted; it does not appear when users view all groups on live feed.
• Automatically approves membership for every user who can access the record.
• Uses the record number as the group name.
• Uses the record short description as a group description.
• Maintains all messages posted to live feed on the record, if the record has a journal field for comments. If the record has a standard text field for comments, each live post overwrites the field value.
• Maintains all messages posted on the record in live feed if the record has a journal field for comments. When the group is created, existing messages are added to the document feed.

A user who participates in live feed becomes a member of the group.

Add a live feed UI action on a table
You can add UI actions on a table to allow users to follow records in live feed.
Role required: ui_action_admin or admin
1. Navigate to System Definition UI Actions.
2. Open one of the live feed UI actions, for example, the Follow on Live Feed list UI action.
3. In the Table field, select the table name.
4. Right-click the header and select Insert to create a copy of the UI action for the desired table.
5. Repeat steps 1 – 4 for all live feed UI actions.

Add the Show Live Feed button in the form header
You can add the Show Live Feed button in the form header for a table.
Role required: personalize_dictionary or admin
1. Navigate to System Definition Tables.
2. Open the table record.
3. If the form does not already have the Live feed check box, configure the form to include this field.
4. Select the Live feed check box.
5. Click Update.

If the check box is selected and the live feed functionality is not active, open the dictionary entry for the table and add live_feed=true in the Attributes field. Click Update.

Configure document feeds
You can configure a table to support document feeds.
Role required: personalize_dictionary or admin
Configuring a table to support document feeds includes the following steps.
1. Add the Show Live Feed button in the form header on page 519.
2. Add Follow on Live Feed and Show Live Feed as list and form UI actions.

Security configuration for document feeds

Document feeds honor the access control rules (ACLs) for the associated record. Users can only view messages on the document feed if they have access to the same information on the record.

Consider the following examples.
- If an ACL allows a user to read and create comments on an incident, then the user can view and add messages posted as comments on the incident feed.
- If an ACL restricts a user from reading work notes, then the user cannot view messages posted as work notes on the incident feed.

**Note:** Access control rules are only checked when a user first accesses the document feed. After users view the feed, an administrator must remove them manually to change their access.

Disable a record feed

You can disable live feed functionality from the form of any table.

Role required: personalize_dictionary or admin

1. Navigate to System Definition Dictionary.
2. Open the dictionary entry for the table.
3. Add live_feed=false in the Attributes field.
4. Click Update.

**Note:** If the Collaboration feature is activated, you can remove the show live feed icon ( ) from all form headers. Set the glide.live_feed.task_header_button property to collaboration.

Disable a document feed

You can disable a document feed from the form of any table.

Role required: personalize_dictionary or admin

1. Navigate to System Definition Tables.
2. Open the table record.
3. Clear the Live feed check box.
4. Click Update.

Business rule installed with Live Feed Document

This business rule is installed with Live Feed Document. There are no tables, roles, or notifications installed with it.

<table>
<thead>
<tr>
<th>Business rule</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Live Feed integration</td>
<td>Writes journal comments to the live feed if there is a group for this record.</td>
</tr>
</tbody>
</table>
Record feeds

A record feed is a live feed group that is associated with a record, such as an incident or change. Record feeds allow users to work on tasks and other records through the live feed interface. Users can post messages in live feed that are automatically maintained as comments or work notes on the record if the record has these journal fields.

You can use record feeds to:

• Improve communication between users working on the same record.
• Improve visibility into progress for end users.
• Provide a single place to see updates on multiple records.
• Save feed history in the record so that knowledge is not lost in an email chain.

Figure 103: Live feed document

Note: Many of these features are part of live feed v2.

Activate live feed document

The Live Feed Document plugin is active by default.

Administrators can enable record feeds in an instance by activating the Live Feed Document plugin, which activates the Live Feed plugin, if it is not active. For upgrades, administrators must activate the plugin.

1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.
   If the plugin depends on other plugins, these plugins are listed along with their activation status.
   If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).
4. If available, select the Load demo data check box.
   Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.
   You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.
5. Click Activate.

Configure record feeds

Configure a table to support record feeds. You can add the Show Live Feed button in the form header and add the UI actions Follow on Live Feed and Show Live Feed as List and Form.
By default, the Show Live Feed icon appears on the form header for all tables that extend task, including the Incident, Change Request, and Problem tables, and in the list and form context menus for all task tables.

Add live feed to a form header
Add the Show Live Feed button in the form header for a table.
1. Navigate to System Definition Tables.
2. Open the table record.
3. Select the Live feed check box.
4. Click Update.
   Alternatively, you can add live_feed=true to the Attributes field in the dictionary entry for the table.

Add live feed to a context menu
Add live feed UI actions on a table.
1. Navigate to System Definition UI Actions.
2. Open one of the live feed UI action, for example, Follow on Live Feed.
3. In the Table field, select the table name.
4. Right-click the header and select Insert to create a copy of the UI action for the desired table.
5. Repeat steps 1 – 4 for all live feed UI actions.

Disable a record feed

You can disable live feed functionality from the form of any table.
Role required: personalize_dictionary or admin
1. Navigate to System Definition Dictionary.
2. Open the dictionary entry for the table.
3. Add live_feed=false in the Attributes field.
4. Click Update.
**Note:** If the Collaboration feature is activated, you can remove the show live feed icon from all form headers. Set the glide.live_feed.task_header_button property to collaboration.

Configure security

Record feeds honor the access control rules (ACLs) for the associated record.

Users can only view messages on the record feed if they have access to the same information on the record. For example:

- If an ACL allows a user to read and create comments on an incident, then the user can view and add messages posted as comments on the incident feed.
- If an ACL restricts a user from reading work notes, then the user cannot view messages posted as work notes on the incident feed.

**Note:** Access control rules are only checked when a user first accesses the record feed. After users view the feed, an administrator must remove them manually to change their access.

Live feed table notifications

Live feed table notifications generate automatic live feed messages. The Live Feed plugin must be activated to use table notifications.

When a record is inserted or updated on a specific task table and the notification conditions are met, a message is generated and posted to the specified group or to the company feed. Table notifications are supported for all task tables and all task types by default.

Administrators and users with the live_feed_admin or chat_admin roles can set up table notifications for any table in an instance.

Set up table notifications for task tables

You can set up a table notification for a task table to enable automatic live feed messages.

Role required: live_feed_admin or chat_admin

1. Navigate to Collaborate Feed Administration Table Notifications.
2. Click New or select a notification to open it.
3. Complete the form.

### Table 105: Live Table Notification fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table</td>
<td>Select the table for which notifications are generated.</td>
</tr>
</tbody>
</table>

**Note:** The list shows only tables and database views that are in the same scope as the table notification.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post to chat rooms</td>
<td>Select the check box to generate the notification in chat rooms that are</td>
</tr>
<tr>
<td></td>
<td>associated with the record, This applies to task records only and requires</td>
</tr>
<tr>
<td></td>
<td>that the Chat plugin is active.</td>
</tr>
<tr>
<td>Post to live feed</td>
<td>Select the check box to generate the notification on live feed.</td>
</tr>
<tr>
<td></td>
<td>If record feeds are not set up and the Feed group field is blank, the</td>
</tr>
<tr>
<td></td>
<td>notification is posted to the company feed.</td>
</tr>
<tr>
<td>Record Feeds</td>
<td>Select the fields to post for record feeds.</td>
</tr>
<tr>
<td></td>
<td>This field is available only if Post to live feed is selected.</td>
</tr>
<tr>
<td>Application</td>
<td>Select the application that contains this record.</td>
</tr>
<tr>
<td>Active</td>
<td>Select the check box to enable the notification.</td>
</tr>
<tr>
<td>Insert</td>
<td>Select the check box to generate the notification when a record is inserted</td>
</tr>
<tr>
<td></td>
<td>into the database.</td>
</tr>
<tr>
<td>Update</td>
<td>Select the check box to generate the notification when a record is updated.</td>
</tr>
<tr>
<td>Feed</td>
<td>Select the live feed team to which you want to post messages. This field</td>
</tr>
<tr>
<td></td>
<td>is available only if Post to live feed is selected.</td>
</tr>
<tr>
<td></td>
<td>Clear the field to post notifications on the company feed.</td>
</tr>
<tr>
<td>Conditions</td>
<td>Create the condition that must be met to generate the notification.</td>
</tr>
<tr>
<td></td>
<td>If you add a condition statement, the system evaluates the condition first</td>
</tr>
<tr>
<td></td>
<td>and parses the Before script field only if the condition is met.</td>
</tr>
<tr>
<td></td>
<td>You may choose to leave this field blank and include conditions in the</td>
</tr>
<tr>
<td></td>
<td>script.</td>
</tr>
<tr>
<td>Description</td>
<td>Enter a description of the table notification.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Message    | Construct the automatic message you want to generate. You can include field values as variables and a link to the record. To add a variable, position the cursor in the text and then click the field name in the Select variables field. To add a link to the record, enter `${URI}` in the message text as shown in the following example. 
  
  **High priority incident opened:**
  `${URI}`
  **Short description:**
  `${short_description}`

  *Note:* For security reasons, any HTML code is automatically stripped out of a message before it is posted. |
| Before script | Create a script that runs before a notification is generated. The script runs only if the condition evaluates to true or is empty. The following variables are available in the script.

  • `current`: the GlideRecord object that triggered the notification.
  • `changedFields`: an ArrayList of fields changed on submit. Use `changedFields.contains('fieldname')` to check for change.
  • `answer`: set answer to false to cancel the notification.
  • `profileSource`: set to a valid GlideRecord object to define the profile that is posting the message.
  • `profileID`: set to a live_profile sys_id to define the profile that is posting the message; by default it is the current record. Overrides `profileSource` if both are specified.

  Any custom variable created in the script is also exposed to the message in the form of `${myVariableName}`. |

4. Click Submit or Update.

Set up table notifications for non-task tables

Table notifications are supported for all task tables by default, and you can set up a table notification for any other table.
Role required: live_feed_admin or chat_admin

1. Navigate to System Definition Business Rules.
2. Open the live feed events business rule.
3. In the Advanced section, select and copy the text in the Script field.
4. Click the back arrow on the top, left to exit the record and return to the Business Rules list.
5. Click New.
6. Enter the following values at the top of the form.
   - Name: Enter a name, such as live feed events for my table.
   - Table: Select the table for which you are setting up a notification.
   - Active and Advanced: Select these check boxes.
7. In the When to run section, enter the following values.
   - When: Select before.
   - Insert, Update, and Delete: Select the check boxes.
8. In the Advanced section, paste the script from the live feed events business rule into the script box.
9. Click Submit.

The live feed events business rule runs on the non-task table. It fires the live_feed.update event, which is associated with the Live Feed Update script action. The script action sets up variables and processes the table notifications.

After saving the business rule, create a live feed table notification record for the new table as you would for a task table.

Live feed table notification examples

The following examples demonstrate how to set up different types of table notifications that are useful for live feed.

Workaround posted
This example demonstrates a table notification that generates an automatic message on live feed whenever a workaround is added to an open problem.

- Table: Problem [problem]
- Active: Select the check box.
- Update: Select the check box.
- Post to live feed: Select the check box.
- Conditions: [State] [is] [Open]
- Description: Workaround Posted
- Message:
  ${sys_updated_by} posted a workaround for ${URI}.
  Short description: ${short_description}
- Before script:
  // only post to live feed when the Workaround field changes
  answer = changedFields. contains ( "work_around" ) ;
**Problem resolved (advanced)**

This advanced example demonstrates a table notification that generates an automatic message on live feed whenever a problem is closed.

It also adds a message about the assigned user and posts the message from the assignment group profile instead of the problem record.

- **Table**: Problem [problem]
- **Active**: Select the check box.
- **Update**: Select the check box.
- **Post to live feed**: Select the check box.
- **Conditions**: [Problem State] [is] [Closed/Resolved]
- **Description**: Problem Resolved
- **Message**: Problem ${number} - ${short_description} has been resolved. ${fixedByMsg}
- **Before script**:

```javascript
//cancel if we didn't just change the problem state if ( !changedFields.contains ( "problem_state" ) )
answer = false ;

//if we have an assigned_to value add a comment about who it was //create a new variable fixedByMsg that we can access from the message
fixedByMsg = "" ; if ( !current. assigned_to. nil ( ) )
```

---

**Figure 104: Example workaround message**
fixedByMsg = " Thank you " + current. assigned_to. getDisplayValue () ;

//make the message appear to come from the assignment group if we have one
if ( !current. assignment_group. nil () )
profileSource = current. assignment_group. getRefRecord () ; //need GlideRecord object

Figure 105: Example problem resolved message

Opportunity won (non-task)
This example demonstrates a table notification on a non-task table. It generates an automatic message on live feed whenever a sales opportunity is won, if you have activated the Sales Force Automation plugin.

Create a business rule on the Opportunity [sales_opportunity] table that matches the live feed events business rule on the task table.

Create a table notification with the following values:
• Table: Opportunity [sales_opportunity]
• Active: Select the check box.
• Update: Select the check box.
• Post to live feed: Select the check box.
• Conditions: [State] [is] [Closed Won]
• Description: Opportunity won
• Message:
  \${owner} closed a sale with \${account}!
• Before script:
  // make the message appear to come from the assigned salesperson if there is one
  if ( !current. owner. nil ( ) )
  profileSource = current. owner. getRefRecord ( ) ; // need GlideRecord object

Figure 106: Example opportunity won message

Related feeds table notification
This example demonstrates table notifications to be sent out to related feeds.

For this example, whenever the status of a story changes to Complete, a table notification message is sent to the related sprint, release, or epic. Messages are posted only if the related feed already exists; this notification does not create a new feed.

• Table: Story [rm_story]
• Active: Select the check box.
• Update: Select the check box.
• Post to live feed: Select the check box.
• Record feeds: Move Sprint, Release, and Epic to the Selected column.
• Conditions: [State] [changes to] [Complete]
• Description: Story is done; message to Epic, Release, and Sprint
• Message:

$\{URI\}$ status changed to $\{state\}$

Live feed security and table access

By default, administrators and users with the live_feed_admin role can configure live feed security and view all live feed tables.

You can also modify the following live feed tables.

• Live Table Notification [live_table_notification]: set up automatic messages that are generated when specific records are updated throughout the system.
• Live Feed Message [live_message]: modify only if necessary, such as to delete an inappropriate message or restore a message that a user accidentally deleted. This table is typically managed by system functionality.

Extending or modifying data in any live feed chat table is not recommended.

Domain separation in Live Feed

This is an overview of domain separation and Live Feed. Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.

Overview

Support: Level 2

Domain separation is supported in this application. Not all ServiceNow applications support domain separation; some include limitations on the data and administrative settings that can be domain separated. To learn more, see Application support for domain separation.

Parent and child domains define the live feed content that can be viewed and shared with other users.

• A user in a parent domain can see users and content within their domain and within all child domains that are lower in the domain hierarchy.
• A user in a child domain can see users and content within their domain but cannot see the parent domain or other child domains at the same level in the domain hierarchy.

Enable domain separation for live feed

Domain separation for the Live Feed application is available starting with the Eureka release. For users upgrading to Eureka, a sys_domain column is added to existing live feed-related database tables. For existing database records, the value of the sys_domain field is set to empty (global). This allows the domain separation feature to work with existing live feed records.
Show or hide the live feed application for a domain

The administrator can live feed visibility for a domain. This includes:

- Displaying live feed in the application navigator.
- Following a document feed for a record.
- Viewing live feed from a record.

Use live feed with domain separation

All of the live feed features are available to users within a domain and work the same way, with some exceptions to visibility.

- Posting and sharing content
  - Users in a child domain can interact with other users in the same domain. This includes posting and replying to messages, deleting messages, attaching files and links, and rating content.
  - Users in a parent domain can interact with other users in the same domain and with users in any child domains. Messages that are added to child threads by parent users are given the visibility of the child domain, not the parent domain.

- Viewing content
  - Users in a child domain can view content that resides within their domain. This includes filtering by feed, sorting, searching, and viewing older messages.
  - Users in a parent domain can view content that resides within their domain and within any child domains.
  - My Feed shows messages, teams, and hashtags based on the user’s domain. Showing another user's feed only shows posts visible in the current user's domain.

- Using hashtags
  - Hashtags are separated by domain. Users in a child domain can use all of the hashtag functions within their domain. This includes tagging messages, viewing available hashtags, changing hashtag names, and searching and filtering by hashtag.
  - Users in a parent domain can use all of the hashtag functions within their domain and can see hashtags in any child domains.

- Using teams
  - Teams are separated across domains. Users in a child domain can join and follow teams within their domain, and can invite other users within their domain to join teams.
  - Users in a parent domain can join and follow teams that belong to their domain or to any child domains.

- Exceptions to teams
  - New teams are created in the user's domain. However, if the team has a record associated with it, the team is created in record's domain.
  - New threads in an existing team are created in the domain of the existing team.
  - When a user is creating a new team from a document, if the document domain is not empty or global, the team domain needs to be changed to be the document's domain.
  - For a document-generated team, when the domain of the document changes, the domain of all related live feed records changes as well.

- Subscribing to email notifications
• Users can subscribe to email notifications from users and teams within their domain only.

Limit live feed access by role

All active users in the instance have access to live feed by default.

live_feed_admin and admin

1. Complete the following steps to define the roles that allow users to see the Live Feed module.
   a) Perform the appropriate action for your version of the UI:
      • UI16: Navigate to System Definition Application Menus Collaborate and select Live Feed.
      • UI15: Right-click the icon beside the Live Feed module and select Edit Module.
   b) Enter the roles that have access in the Roles field.
   c) Click Update.

2. Complete the following steps to define the roles that allow users to see live feed from a mobile device.
   a) Navigate to System Definition Applications (Mobile).
   b) Click Live Feed.
   c) Enter the roles that have access in the Roles field.
   d) Click Update.

3. Use the following settings in the Access Control form to create access control rules to limit who can view the live_feed pages.
   • Type: ui page
   • Operation: read
   • Name: create one access control rule record for each of the following pages
     • live_feed
     • live_feed_small
     • $live_feed
     • $live_feed_small
   • Requires role: in this related list, add roles to define who can access the live feed pages. Users who do not have these roles cannot access live feed.

Manage live feed message content

Users can remove their own messages from feeds. If necessary, administrators can remove inappropriate messages that are posted by any user.

live_feed_admin and admin

For security reasons, any HTML code is automatically stripped out of a message before it is posted. This measure ensures that users cannot modify any page settings by posting a message.

1. Navigate to Collaborate Feed Administration Messages.
2. Open the message to be removed.
3. In the State field, select deleted. You may need to configure the form to add this field.
4. Click Update.
Live feed team security

You can restrict who can create teams by modifying an access control rule.

Modify the following access control rule.

- Table: Live Group Profile [live_group_profile]
- Operation: create

Restrict hashtag renaming

You can restrict who can rename hashtags.

You restrict hashtag rename by modifying the following access control rule:

- Table: Live Tag [live_tag]
- Operation: write

Provide access to live feed from CMS pages

You can provide access to live feed from pages built in the Content Management System (CMS). For example, allow an end user to access your company feed via the ESS portal.

Role required: content_admin or admin

The ESS Portal template includes the Portal - Live page and Live Feed dynamic blocks. To provide access to live feed from CMS pages, add the Live Feed dynamic block to a CMS page or include Portal - Live page in a site.

1. Navigate to Content Management iFrames.
2. Click New.
3. Enter the iFrame block details.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a unique name such as Live Frame.</td>
</tr>
<tr>
<td>Frame Name</td>
<td>Enter a frame name, such as live_frame.</td>
</tr>
<tr>
<td>URL</td>
<td><a href="https://INSTANCE/live_feed.do?sysparm_doctype=true">https://INSTANCE/live_feed.do?sysparm_doctype=true</a> where INSTANCE is your instance URL (example, [instance name].service-now.com)</td>
</tr>
<tr>
<td>Application</td>
<td>Displays scoping information.</td>
</tr>
<tr>
<td>Sizing</td>
<td>Select Fixed Size and enter height and width pixel dimensions according to the page where you plan to display the feed (for example, width of 1024 and height of 768).</td>
</tr>
</tbody>
</table>

4. Click Submit.
5. Add the block to a page.
Components installed with live feed

Several types of components are installed with Live Feed.
Demo data is available with Live Feed.

Tables installed with live feed

Live Feed plugin installs the following tables.

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Link attachments [live_link]</td>
<td>Stores links and attachments that are added to messages.</td>
</tr>
<tr>
<td>Live Favorite [live_favorite]</td>
<td>Stores the favorite conversations, user groups, and messages.</td>
</tr>
<tr>
<td>Live Feed Searches [live_feed_search]</td>
<td>Stores live feed text searches. Access at Collaborate Feed Administration Search Log</td>
</tr>
<tr>
<td>Live Follows [live_follow]</td>
<td>Maintains users' follow preferences for user feeds.</td>
</tr>
<tr>
<td>Live Group Profile [live_group_profile]</td>
<td>Stores conversation properties, including name, description, and public status. Also stored are user group properties, such as name, description, and public status.</td>
</tr>
<tr>
<td>Live Group Member [live_group_member]</td>
<td>Maintains the member lists for conversation and user group.</td>
</tr>
<tr>
<td>Live Mention [live_mention]</td>
<td>Stores the profiles mentioned in a message. References sys_user table.</td>
</tr>
<tr>
<td>Live Message Tag [live_message_tag]</td>
<td>Stores messages associated with user-created tags. Appears as a related list on Live Tag records.</td>
</tr>
<tr>
<td>Live Poll [live_poll]</td>
<td>Stores a poll question.</td>
</tr>
<tr>
<td>Live Poll Cast [live_poll_cast]</td>
<td>Stores profiles of users who voted for a particular option in a poll.</td>
</tr>
<tr>
<td>Live Poll Options [live_poll_option]</td>
<td>Stores poll options.</td>
</tr>
</tbody>
</table>
### Live Table Notification

[live_table_notification]

Generates automatic table notifications, such as when a user reads live feed for the first time and when a high priority incident is opened. Access at Collaborate Feed Administration Table Notifications.

### Live Tag

[live_tag]

Maintains user-created tags. Access at Collaborate Feed Administration Tags.

### Live Tag Follows

[live_tag_follow]

Maintains users’ follow preferences for tags.

### Messages Liked by

[live_message_like]

Maintains like ratings for posts. Access at Collaborate Feed Administration Likes.

### User roles installed with Live Feed

Live Feed plugin installs the following user roles.

<table>
<thead>
<tr>
<th>Role</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>live_feed_admin</td>
<td>Can manage live feed functions.</td>
</tr>
<tr>
<td>chat_admin</td>
<td>Can manage chat functions (if the Chat plugin is activated)</td>
</tr>
</tbody>
</table>

### Script includes installed with Live Feed

Live Feed plugin installs the following script includes.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LiveMsgUtil</td>
<td>Provides helper functions for working with live_message records.</td>
</tr>
<tr>
<td>LiveFeedFilter</td>
<td>Queries filters for working with live_feed records.</td>
</tr>
<tr>
<td>LiveFeedUtil</td>
<td>Provides helper functions for working with live_feed records.</td>
</tr>
</tbody>
</table>

### Business rules installed with Live Feed

Live Feed plugin installs the following business rules.

<table>
<thead>
<tr>
<th>Business rule</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed Group Creator Becomes Admin</td>
<td>Live Group Profile [live_group_profile]</td>
<td>Designates the group creator as the group administrator.</td>
</tr>
<tr>
<td>Business rule</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>--------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>live feed events</td>
<td>Task [task]</td>
<td>Runs on task insert, update, and delete. Triggers event associated with the Live Feed Update Script action that processes Live Table Notifications to auto-generate live feed messages.</td>
</tr>
<tr>
<td>Live feed member update events</td>
<td>Live Group Member [live_group_member]</td>
<td>Generates a notification event when member state changes (invited, accepted, declined, left, rejected, request, request_accepted).</td>
</tr>
<tr>
<td>Live feed integration</td>
<td>Journal Entry [sys_journal_field]</td>
<td>Writes journal comments to the live feed if there is a group for this record.</td>
</tr>
<tr>
<td>Live feed new member events</td>
<td>Live Group Member [live_group_member]</td>
<td>Generates a notification event when new members are added.</td>
</tr>
<tr>
<td>live feed profile events</td>
<td>Live Profile [live_profile]</td>
<td>Runs on live_profile insert/update/delete, triggers event associated with the Live Feed Update script action that processes Live Table Notifications to auto-generate live feed messages.</td>
</tr>
<tr>
<td>Live Feed message events</td>
<td>Live Feed Message [live_message]</td>
<td>Runs on live_message, notification event trigger for new live messages.</td>
</tr>
<tr>
<td>Live message like events</td>
<td>Message Liked by [live_message_like]</td>
<td>Runs on live_message_like, notification event trigger for new like records.</td>
</tr>
<tr>
<td>LiveFeed Group Member Visibility 2.0</td>
<td>Live Group Member [live_group_member]</td>
<td>Ensures users can only see the members list for public groups and groups they belong to.</td>
</tr>
<tr>
<td>LiveFeed Group Profile Validation</td>
<td>Live Group Profile [live_group_profile]</td>
<td>Ensures that a public group is visible.</td>
</tr>
<tr>
<td>LiveFeed Group Profile Visibility 2.0</td>
<td>Live Group Profile [live_group_profile]</td>
<td>Ensures that the list of all groups only displays public groups, private groups that are visible, and groups the user belongs to.</td>
</tr>
<tr>
<td>LiveFeed Membership Changes</td>
<td>Live Group Member [live_group_member]</td>
<td>Ensures that only the group administrator and users with live_feed_admin role can manage membership for a group.</td>
</tr>
</tbody>
</table>
### Business rule | Table | Description
--- | --- | ---
LiveFeed Single Group Membership | Live Group Member [live_group_member] | Ensures that a user is not added multiple times to the same group.
Live Message Likes | Live Message Like [live_message_like] | Updates the number of likes for a message.
LiveFeed Join Group Check | Live Group Member [live_group_member] | Ensures that users can not automatically join private visible groups.
Update Follow/Follower Counts | Live Follow [live_follow] | Updates the following/followers counts.
Live Feed Group | Assessable Record [asmt_assessable_record] | Creates/Deletes a live feed group for an assessable record
Live Feed Message Visibility | Live Feed Message [live_message] | Ensures user's access to live feed messages

### Email notifications installed with Live Feed

Live Feed plugin installs the following email notifications.

| Email notification | Description |
--- | ---
Live Feed Feed Member Accepted | Sends an email to the administrator when a user has accepted to join the feed.
Live Feed Feed Member Declined | Sends an email to the administrator when a user has declined to join the feed.
Live Feed Feed Member Invited | Sends an email to a user when they have been invited to join a feed.
Live Feed Feed Member Left | Sends an email to the administrators when a user has left the feed.
Live Feed Feed Member Removed | Sends an email to user when they have been removed from the feed.
Live Feed Feed Member Request | Sends an email to administrators when an user requests to join a feed.
Live Feed Feed Member Request Accepted | Sends an email to the user when their request to join a feed is accepted.
Live Feed Feed Request Rejected | Sends an email to the user when their request to join a feed has been rejected by an administrator.
Live Feed MsgReply Subscription | Sends an email when a reply or reply_to_reply message is inserted into the thread of a message in a feed.
Live Feed Team Member Accepted | Sends an email to administrators when a user accepts an invitation to join a team.
<table>
<thead>
<tr>
<th>Email notification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Live Feed Team Member Declined</td>
<td>Sends an email to administrators when a user declines an invitation to join a team.</td>
</tr>
<tr>
<td>Live Feed Team Member Invited</td>
<td>Sends an email when a user is invited to join a team.</td>
</tr>
<tr>
<td>Live Feed Team Member Left</td>
<td>Sends an email when a user leaves a team.</td>
</tr>
<tr>
<td>Live Feed Team Member Removed</td>
<td>Sends an email when an administrator has removed a user from a team.</td>
</tr>
<tr>
<td>Live Feed Team Member Request</td>
<td>Sends an email when a user requests to join a team.</td>
</tr>
<tr>
<td>Live Feed Team Member Request Accepted</td>
<td>Sends an email when a user's request to join a team is accepted.</td>
</tr>
<tr>
<td>Live Team Member Request Rejected</td>
<td>Sends an email when a user's request to join a team is rejected.</td>
</tr>
<tr>
<td>Live Message All Subscription</td>
<td>Sends an email to subscribed users when any message (new or reply) is posted.</td>
</tr>
<tr>
<td>Live Message Feed Subscription</td>
<td>Sends an email when a new message is inserted into a feed.</td>
</tr>
<tr>
<td>Live Message Liked</td>
<td>Sends an email to the creator of a message when another user likes the message.</td>
</tr>
<tr>
<td>Live Message Mention</td>
<td>Sends an email to a user when that user is mentioned in a message.</td>
</tr>
<tr>
<td>Live Message New Posts Subscription</td>
<td>Sends an email to subscribed users when a new (not reply) message is posted.</td>
</tr>
<tr>
<td>Live Message Reply</td>
<td>Sends an email to all users in a feed thread when a user posts a reply (live_message.replied event).</td>
</tr>
</tbody>
</table>

**Use Live Feed**

Live Feed provides many methods you can use to share content with others in your organization. Depending on your role, there are several different types of feeds you can access, teams you can join and share information with, and hashtags you can use for categorizing messages.
Note: Live Feed v2 is active for all new instances by default. If you are upgrading from an earlier version of ServiceNow, you need to activate Live Feed v2 to use these features.
Use hashtags in Live Feed

Hashtags are words marked with a hash symbol (#) in messages. Hashtags are a way to categorize messages by keyword or topic for improved search results.

For example, to identify messages associated with VPN questions, add the hashtag #VPN in the message text.

**Note:** Many of these features are part of live feed v2. If you are using live feed v1, or have not activated live feed v2, see Legacy Live Feed.

Tag messages

To tag a keyword or topic in a message, enter a # symbol before the word. A link to the hashtag is added beneath the message and all feed users can search and filter by the hashtag to find the message.

Tips for using hashtags effectively include:

- Limit the number of hashtags per message (no more than 3 is a good guideline).
- Use hashtags only in messages that are relevant to the tagged topic.
- Write a message first, and then add hashtags only if they add value. Answer the question, "What are you working on?", rather than "What hashtags apply to what you are working on?"
- Use camel case to create a hashtag that is more than one word long. For camel case, remove the space and use an uppercase letter to start each word. For example, to create a topic about the service desk, use #ServiceDesk.
View an available hashtag

View a hashtag from any feed.

1. Navigate to Collaborate Live Feed.
2. Click Hashtags in the sidebar.
   Any hashtags already defined are displayed. Up to 36 hashtags can be displayed, and options are available for searching and sorting the hashtags. When searching, you do not need to include the hash symbol (#).
3. Click a hashtag to view all messages containing that hashtag.

Change a hashtag name and merge a hashtag

Over time, users may create many hashtags with similar names, such as competitive, competitor, and competition. To combine hashtags for better searching and filtering, change the names of similar hashtags to a standard name.
Administrators can restrict who can rename hashtags.

1. Navigate to Collaborate Live Feed.
2. Click Hashtags in the sidebar to reveal the currently defined hashtags.
3. Turn off the filter to show all hashtags.
4. Point to the hashtag you want to change. If you have the rights to edit hashtags, an edit tag ( ✍️ ) appears.
5. Click the edit tag icon.

![Hashtags]

**Figure 111: Edit tag**

6. Enter a new hashtag name.
7. Press Enter.

- If the new name is different than the other hashtags, the new hashtag name replaces the old hashtag name on the list and in the text of any messages that include the hashtag.
- If the name is the same as one of the existing hashtags, the hashtags will be merged. For example, if you have two hashtags called Competitive and Competitors, and you change the name of Competitors to Competitive, all of the messages previously tagged Competitors are changed to Competitive and the Competitors hashtag is removed.

**Note:** If a hashtag is removed from the message, renaming that hashtag does not change the message text.

Add an image to a hashtag

You can add an image at the domain level of already defined hashtags if you have the admin role.

1. Click Hashtags in the sidebar.
2. Select the appropriate hashtag.

![#VPN Feed]

**Figure 112: Tag with image icon**

3. Do one of the following:
• Locate the image in your file system, and then drag-and-drop the image onto the add an image icon ( ).

• Click the add an image icon ( ), select the image file, and click Open.

4. To change the image, simply drag-and-drop a new image onto the old one, or click on the existing one and select a new image.

When you view a message that contains a hashtag with an image, that image appears in the hashtag heading bar.

Follow and unfollow a hashtag

You can view all postings assigned a specific hashtag by following the hashtag. You can also unfollow the hashtag if you no longer want to view those postings.

1. Navigate to Collaborate Live Feed .
2. Click Hashtags in the sidebar.
3. Select the hashtag you want to follow.
4. Click Follow.
Figure 114: Follow tag

A confirmation message appears.

5. Click X to dismiss the message.
   To unfollow a hashtag, repeat the same steps and click Unfollow.

Bookmark hashtags

The live feed interface uses the standard bookmarking functionality for hashtags.

In UI15, the live feed interface uses the standard *bookmarking functionality* for hashtags. You can drag-and-drop group feeds and hashtags from the Feed Summary section to the Edge for quick access.
Remove a hashtag from a posted message

As a participant in a conversation, you can remove hashtags from messages that have already been posted.

1. Navigate to the posted message.
2. Click Hashtags in the message posting.

The hashtags associated with the message are displayed, along with the removal icon.
3. Click the removal icon.

Use teams in Live Feed

Users can be combined into teams for the purpose of subscribing to specifically-focused feeds. Teams can be created based on any criteria that makes sense for your organization. For example, you can create a team called IT Developers and subscribe the team to feeds such as Coding Standards, AngularJS Development, and ServiceNow Customization Best Practices. When a new developer is added to the IT Developers team, that user automatically has rights to participate in all of the feeds followed by the team.

Create a live feed team

When you create a team, you become the team administrator. As team administrator, you can:

- Modify team properties
- Accept or reject membership requests
- Remove members from the team
- Delete the team

1. Navigate to Collaborate Live Feed.
2. In the sidebar, click your profile picture, then select the Teams tab.
3. Click Create Team.

4. Enter a Name to appear at the top of the feed and in messages posted to the team. This name links to the team feed.
5. Enter a Description to appear at the top of the feed and under the team name in the list of all teams.

6. Select the access level for the team:
   - Public Team: In the list of all teams, any user can see the name of this team. Any user can also see the feed and join the team. Messages in a public team appear in the Company Feed with a link to the team feed.
   - Private Team: In the list of all teams, any user can see the name of this team, but not the feed. Messages in private teams do not appear on the Company Feed.

When Private Team is selected, the Show this team for anyone to find and request to join check box is displayed. Select this check box to allow any user to search for this team and request to join it. Clear the check box to allow only invited users to see the feed and join the team.

7. Click Create.
The team is created with you as the team administrator.

---

**Note:** A team administrator can create one or more group feeds specifically for the members of this team by clicking the Group Feeds tab and Create Group Feed. Additionally, the team can be invited to join a feed. Having multiple feeds for the team facilitates focused discussions on topics of interest to the team and allows the team to selectively invite other teams and members to collaborate on specific feeds.
Automatic team creation

If you create a record on a table that has live feed enabled, such as the Incident table, and click Follow/Show Live Feed for the record, a record feed is created for the record. The record feed name is based on the table name.

Join a team

You can join a public team, accept an invitation, or request access to a team. As a team member, you can:

• View messages posted to the team (team feed). Non-members can also view the feed for a public team.
• View a list of team members.
• Invite another team to join the team.
• Subscribe to team email notifications.
• Leave the team.

1. Navigate to Collaborate Live Feed.
2. Click Teams and click All Teams.
   • If you received an invitation, click Accept. You can Decline the invitation if you do not want to join the team.
   • If the team is public, click Join.
   • If the team is private, click Request. The team administrator receives an email notification and must accept your request before you can join the team.

View a team feed

View a team feed to see messages belonging to that team.

1. Navigate to Collaborate Live Feed.
2. In the sidebar, click your profile picture, then select the Teams tab.
   • To view a team you belong to, select the team name.
   • To view a public team you do not belong to, select All Teams and then click the team name.
   
     You must be a member to view the feed for a private team.

View a team member

View a list of members belonging to a live feed team.

1. Navigate to Collaborate Live Feed.
2. In the sidebar, click your profile picture, then select the Teams tab.
3. From the team list, select the team name.
   
     You must be a member of the team to view the members.
4. Click Members.
   
     The list of team members appears, organized by team administrators and team members.
Invite a new member

You can invite another user to join a team.

1. Navigate to Collaborate Live Feed.
2. In the sidebar, click your profile picture, then select the Teams tab.
3. From the team list, select the team name.
4. Click the Pending members tab.
5. In the Add User field, enter the name of the user you want to invite. The invited member’s picture appears.

Remove a member

If you are team administrator, you can remove any member from the team.

1. Navigate to Collaborate Live Feed.
2. In the sidebar, click your profile picture, then select the Teams tab.
3. From the team list, select the team name.
4. Click the Members tab.

5. Click Remove below the member name.
6. Click Remove again in the confirmation box that opens.

**Note:** You can remove members regardless of their current state. That is, you can remove members who have already joined the team or whose membership is pending.

---

**Subscribe to team and email notification**

Users can subscribe and unsubscribe to receive email notifications generated by feeds the team participates in.

Email notifications are generated whenever actions such as posting messages, replies, likes, polls, and @mentions are performed.

All notifications related to a top-level message, such as replies, mentions, and likes, are sent out with the same subject. The subject line defaults to Live Feed followed by the beginning of the subject line from the top-level message. For example, if the subject of the feed is IT Support, the email notification’s subject will be Live Feed IT Support.

1. Navigate to Collaborate Live Feed.
2. Click Teams and select the team name.
3. Click the subscribe icon ( ).

You can click the unsubscribe icon ( ) to stop receiving email notifications.

Subscribe a team to feed notification

A team administrator can subscribe a team to specific feeds so the members of the team receive email notifications.

1. Navigate to Collaborate Live Feed.
2. Click Teams and select the team name. You can use the advanced search to locate team of which you are the administrator.
3. Click Feeds.
4. Click the subscribe icon ( ) beside the feed name.

You can click the unsubscribe icon ( ) to stop receiving email notifications.

Reply to email notifications using email

After receiving an email about a posted message or a reply, you can reply to live feed with your email client.

The body of the reply email becomes a reply to the live feed message. Any attachments included in your reply email are included in the live feed reply.

Leave a team

You can give up membership to a team by leaving that team.

1. Navigate to Collaborate Live Feed.
2. In the sidebar, click your profile picture, then select the Teams tab.
3. Click Leave beside the team name.

Modify a team

If you are team administrator, you can modify an existing team.

1. Navigate to Collaborate Live Feed.
2. In the sidebar, click your profile picture, then select the Teams tab.
3. From the team list, select the team name.
4. Click the edit icon ( ).
5. Modify the team properties as needed.
6. Click Save.

Manage a membership request

When a user requests membership to a private team, the team administrator receives an email.

If you are the team administrator, you can manage membership requests.

1. Navigate to Collaborate Live Feed.
2. Click Teams and select the team name. If one or more users have been invited to the team, the Pending members tab shows the number of invitations sent.

![Pending members](finance.png)

*Figure 118: Pending members*

3. Click Pending members.

This shows the users who have received invitations, but who have not yet accepted.
Figure 119: Invited members

4. You can cancel a user's invitation by clicking Remove.
5. You can invite another user to the team by entering their name in the Add user field and clicking the Invite member button.

Delete a team

If you are the team administrator, you can delete a team.

1. Navigate to Collaborate Live Feed.
2. In the sidebar, click your profile picture, then select the Teams tab.
3. From the team list, select the team name.
4. Click the edit icon.
5. Click Delete.

6. Click Yes to confirm deletion.

The team is deleted from live feed. Messages posted to a private team are deleted; messages posted to a public team remain on the company feed without a team link.

If you delete a team that is associated with an active record, such as an incident that has not yet been closed, the team becomes active again when any user modifies that record or follows the record on live feed. The first user who modifies the record becomes the team administrator. The previous messages that existed as part of the record feed are not deleted.

Use live feed to work on records

A record feed is associated with a record, such as an incident or change.

Record feeds help users collaborate on records by providing a place for anyone who can access the record to share messages and post attachments specific to that record.

With record feeds, users can:

• Follow record feeds and post messages in live feed. These messages can also be automatically maintained in the comments or work notes journal fields on records.
• View live feed from records.
• Work on multiple records from My Feed.
• Access live feed team functions, such as sending invitations and subscribing to email notifications.

Any users with access to the record can also use the record feed. By default, record feeds are available on the incident, change, and problem tables. Administrators can configure record feeds for additional tables.
How Document Feeds Work

The Live Feed application creates a document group for each document feed. The document group:

- Automatically approves membership for every user who can access the record.
- Uses the record number as the group name.
- Uses the record short description as a group description.
• Maintains all messages posted on the record in live feed (if the record has a journal field for comments). When the group is created, existing messages are added to the document feed.
• Lists the group when users select View all groups on their live feed interface, unless the record associated with the document feed has been closed. When the state of the record is closed, the live feed group becomes inactive and unlisted.
• Automatically adds users to the document group when they view the record.

Document Group Creation

When a user follows or shows a record on live feed, a live feed group is automatically created and associated to the record (if one does not already exist). The user becomes a member of the group and can use live feed to work on the record. If the user can access work notes on the record, the user also becomes a group administrator.

A live feed group is also automatically created when a user creates a record on a table that uses document feeds, such as the Incident table. The user who creates the record becomes the administrator of the group, and any other user who modifies the same record automatically joins the group.

Add Live Feed to a homepage

Add live feed to a homepage so it is the first thing you see when you log in.
1. Click Add content at the top of the homepage.
2. Select Live Feed in the left panel.
3. On the bottom of the window, click Add here in the appropriate layout position, then close the window.

   Note: Administrators can add live feed to a global homepage to make it available for all homepage users by default. By default, users with any role can add live feed to their homepage. Administrators can restrict this ability.
Modifying and deleting document feeds

The user who creates a record feed becomes the group administrator, which allows the user to modify the following record feed properties.

- **Name**: default value is the record number.
- **Description**: default value is the record short description.
- **Picture**: default value is a thumbnail image of the record.

Feed administrators can also delete the feed. When deleted, the feed is removed from live feed but messages remain in the journal field of the associated record.

Viewing Live Feed from records

Interact with the record feed in any form that has live feed enabled.
The record feed appears in a pop-up window. The record feed also appears on the record form’s activity formatter if the administrator enables the record feed system property (glide.ui.show_live_feed_activity).

To access a record feed from the form, do one of the following:

- Click the Show Live Feed button in the form header. This displays the live feed pop-up.
- Right-click the form header and select Show Live Feed. This also displays the live feed pop-up.
- Scroll down to the activity formatter area on the form. Click one of the following tabs:
  - Live Feed: click to show a text box to type in the feed.
  - Activity: click to show the activity summary. The activity filter determines the content in the activity summary.
If the activity formatter or the Live Feed and Activity tabs are not visible, administrators can do the following:

- Configure the form layout and add Activities (filtered) to the form. This adds the activity formatter.
- Personalize the form layout and add Activities (filtered) to the form. This adds the activity formatter.
- Go to System Definition Tables, access the table associated with the record, and verify that the live_feed dictionary attribute is set to true on the form. This adds live feed to the activity formatter.
• Go to Collaborate Feed Administration Properties and enable the following property: Toggle the display of the live feed tab in the activity formatter

Working with record feeds

When a user follows a record, the user becomes a member of a private group for the record.

Team members can:
• View the record feed from live feed.
• View a list of group members (other users who are following the record).
• Invite another user to join the group. Only users who have access to the record have access to the record feed.
• Subscribe to email notifications.
• Leave the team to stop following the record.

Follow a record feed from a form

You can follow records that have a record feed associated with them from within the record form.

1. Navigate to the record in a list or form.
2. Click the Show on Live Feed icon in the header.
Figure 123: Follow Task

Follow a record feed from a list
You can follow records that have a record feed associated with them when viewing a list of records. This method allows you to select multiple records to follow.

1. Navigate to a list of records (for example, Assigned to me).
2. Select the Action check box beside each record to follow.
3. In the Actions choice list, select Follow on Live Feed.
Figure 124: Follow My Tasks

Post a message to a record feed
Use live feed to post a message to a record feed.

1. Open the record feed in one of the following ways:
   - From your homepage (must already be following the record)
   - As a team in live feed (must already be following the record)
   - From My Live Feed (must already be following the record)
   - From the Live Feed pop-up window
   - From the Live Feed tab on the activity formatter
   - Click the Show Live Feed button

2. Compose the message and add images and links.
3. [My Live Feed only] In the To list, select the record where you want to post the message.
4. [Optional] Select the Work Notes check box to post the message as a work note. Only users with access to work notes on the record can post and see work notes. This option is only available for records that have a journal field.
5. Click Post.

Note: If the record has journal fields for comments or work notes, your message is automatically added to the appropriate field on the record. If the record has a standard
Use feeds in Live Feed

Feeds allow users to create focused discussions in Live Feed.

Live feed includes different types of feeds. The user who creates a group or record feed becomes the feed administrator. This user configures the access level for the feed:

- Public: any user can see the name on the list of all feeds, view the feed, and join it. Messages appear on the company feed with a link to the public feed.
- Private: any user can see the name on the list of all feeds, but only invited members can view the feed and join. Messages do not appear on the company feed.

Note: The concept of groups has changed in live feed v2 (starting with the Fuji release).

Create a group feed

Group feeds are created by users so that members with similar interests can find that information in one place. Individual users or teams can join group feeds.

1. Navigate to Collaborate Live Feed.
2. Click Group Feeds and click All Feeds.
3. Click Create Group Feed.

![Create group feed](image.png)

Figure 125: Create group feed

4. Enter the feed name and description. These will appear in the list of group feeds.
5. Indicate how members can join the feed:
   - Public Feed: Select this to allow anyone to view and join the group feed.
   - Private Feed: Select this to restrict membership to only members invited by the administrator.
When Private Feed is selected, the Show this feed for anyone to find and request to join check box is displayed. If it is selected, any user can search for this group feed and join it. If the check box is not selected, only users who are invited can see the feed and join the group feed.

6. Click Create.

Create record feeds

When a user views a record on a table that has live feed enabled, such as the Incident [incident] table, the user can click the Show live feed button at the top of the form to automatically create a record feed.

When a user who has write access to a record’s work_notes journal field clicks the Show live feed button, that user becomes the record feed administrator. If, for example, a customer calls technical support to report an incident and the customer clicks Show live feed on a record, a record feed is created, but the customer is not the record feed administrator. When a support representative later opens the incident and participates in the record feed, the user becomes the feed administrator.

Record feeds are, by default, private unlisted. That is, only invited members can see the name of the record feed in the list of feeds, and join it. Record feed administrators, however, have the ability to change the access level at any time. This can be helpful if, for example, a user is working on a sales opportunity and wants customers to be able to participate in a record feed without granting them access to the records.

Control how live feed is enabled for records

A property called glide.ui.show_live-feed_activity controls whether live feed is automatically enabled for all records.

This glide record is disabled by default. If the property is enabled, a record feed is automatically created whenever a record is viewed, and you become a member of that feed.

A second property, glide.live-feed.auto_join_document_group, enables automatic membership to a record feed whenever the associated document is visited and the user clicks Show Live Feed.

View the activity stream in record feeds

When you view record feeds, live feed displays the activity stream for the document.

For example, for an incident feed, the screen displays recent activity for the incident. The activity stream is updated whenever anything is changed in the associated record.
Figure 126: Live feed activity stream

Note: The information in the activity stream is subject to the same ACL rules as those for viewing the underlying document.
Participate in a feed

When you join a feed, you become a feed member.

Feed members can:

- View messages posted to the feed. Non-members can also view the messages for a public feed.
- View a list of feed members.
- Invite another user to join the feed.
- Subscribe to feed email notifications.
- Leave the feed.

1. Navigate to Collaborate Live Feed.
2. Click either Group Feeds or Record Feeds, and then click All Feeds.
Figure 127: All feeds

- If you received an invitation, click Accept. You can Decline the invitation if you do not want to join the feed.
- If the feed is public, click Join.
- If the feed is private, click Request. The feed administrator receives an email notification and must accept your request before you can join the feed.

Mark a feed as a favorite

Top-level messages in feeds can be marked as favorites on a per user basis only.
You can also search for messages marked as favorites, and remove the favorite designation as needed.

1. Navigate to Collaborate Live Feed.
2. Click either Group Feeds or Record Feeds, and then click All Feeds.
3. In the list of feeds, click the star icon (🌟) adjacent to the feed name you want to mark as a favorite.

   To unfavorite a message, click the star icon (🌟) of a message that is already a favorite.

---

**View a feed**

You have several options for viewing a feed.

1. Navigate to Collaborate Live Feed.
2. Click either Group Feeds or Record Feeds.
   
   This displays a list of feeds you belong to and an option to view all feeds.
   
   - To view a feed you belong to, select the feed name.
   - To view a public feed you do not belong to, select Show All and then click the feed name. You must be a member to view the feed for a private feed.

   **Note:** If you navigate away from the live feed application and then back again, the system displays the feed you last visited if you are a member of it.

---

**View a feed member**

View a specific member of a group feed.

1. Navigate to Collaborate Live Feed.
2. Click either Group Feeds or Record Feeds.
   
   This displays a list of feeds you belong to and an option to view all feeds.
3. Click the feed name.
   
   The list of feed members appears, organized by feed administrators and members.

---

**Invite a new member to a group feed**

The feed administrator can invite another user or a group to join a feed.

When a team is added to a feed, all members of the team also indirectly become members of the feed. Only users, and not teams, can be the feed administrators. A team member who is following a feed can become administrator by directly inviting another user to the feed.

1. Navigate to Collaborate Live Feed.
2. Click either Group Feeds or Record Feeds, and then select the feed name.
3. Click the Pending members tab.
4. In the Add user or team field, begin entering a user or team name and select a user or team from the suggestion list.
   
   The invited user or team members receive an email notification.

---

**Invite a new member to a record feed**

The feed administrator can invite another user or a team to join a record feed.
When a team is added, each of the individual members of the team become members of the feed. That is, if Team ABC is added to a feed, the feed does not show that Team ABC is a member. Instead, the feed shows each of the individual members of Team ABC as members of the feed.

When users are invited, their membership state is initially Invited. When they accept the invitation, the system checks their access to the work_notes journal field. If they have write access, they become administrator members; otherwise, they become active members.

1. Navigate to Collaborate Live Feed.
2. Click Record Feeds and select the record feed name.
3. Click the Pending members tab.
4. In the Add user or team field, begin entering a user or team name and select a user or team from the suggestion list.

   If you invite a team, the individual members of the team are invited.

   The invited users receive an email notification.

Remove a member from a feed

The feed administrator can remove any member from the feed.

1. Navigate to Collaborate Live Feed.
2. Click either Group Feeds or Record Feeds, and then select the feed name.
3. Click the Members tab.
4. Locate the member you want to remove and click Remove.
You can remove members regardless of their current state. That is, you can remove members who have already joined the feed or whose membership is pending.

Subscribe to a feed

Direct members of a feed can subscribe and unsubscribe to the feed in order to receive email notifications whenever any activity in the feed occurs, such as new messages being posted, replies, likes, polls, and @mentions.

Individual indirect members—that is, members of a team that is participating in a feed—cannot subscribe or unsubscribe from a feed directly. If the team administrator subscribes the team to a feed, the individual members receive an email notification for activities in the feed such as new messages being posted, replies, likes, polls and @mentions.

All notifications related to a top-level message, such as replies, mentions, and likes, are sent out with the same subject. The subject line defaults to Live Feed followed by the beginning of the subject line from the top-level message. For example, if the subject of the feed is IT Support, the email notification’s subject will be Live Feed IT Support.

1. Navigate to Collaborate Live Feed.
2. Click either Group Feeds or Record Feeds, and then select the feed name.
3. Click the subscribe icon ( ).

You can click the unsubscribe icon ( ) to stop receiving email notifications.

**Note:** If a team is subscribed to receive email notifications for a feed, but a member of the team did not subscribe to the team, that member does not receive the email notifications.

### Navigate between live feed and other modules

If you are participating in a feed and navigate to another module, when you return to live feed it displays the feed you were previously viewing if it is public or if it is a private feed that you are a member of.

For example, assume you are viewing a public feed and then navigate to a particular incident record. Upon returning to live feed, the feed you were previously viewing opens. If you were last viewing a private feed that you are not a member of, returning to live feed opens the Company Feed.

### Leave a feed

Members can choose to leave a group feed.

1. Navigate to Collaborate Live Feed .
2. Click either Group Feeds or Record Feeds, and then select the feed name.
3. Click Leave.

**Note:** If you leave a **feed** associated with a record, such as an incident, you automatically rejoin that feed if you modify the associated record again.

### Delete a feed

If you are a feed administrator, you can delete the feed.

1. Navigate to Collaborate Live Feed .
2. Click either Group Feeds or Record Feeds, and then select the feed name.
3. Click Delete.
4. Click Yes to confirm deletion.

The feed is deleted from live feed. Messages posted to a private feed are deleted. Messages posted to a public feed remain on the Company Feed without a feed link.

### Live Feed UI overview

The Live Feed user interface provides many methods you can use to share content with others in your organization.

### Update your Live Feed profile

Your profile information includes a photo or image, and tabs for different types of information including messages, feeds, teams, followers, and those who are following you. You can update your profile information and picture at any time.

**Note:** The functionality described here applies to HTML5-compliant browsers, such as Chrome, Firefox, Safari and IE10 and above.

1. Navigate to Collaborate Live Feed .
2. Click your name or title displayed below your picture.

![Profile](image1.png)

Figure 129: Profile

The profile record opens.

![Profile record](image2.png)

Figure 130: Profile record

3. Click the pencil icon next to About Me and type a short description about yourself that you want to share with others who view your profile. This is text that you might not necessarily want to change on a regular basis.
4. You can change your profile photo using either of the following two methods:
   • Locate the photo file you want to use, and drag-and-drop it over the existing photo.
   • Hover over the existing picture (or tap the photo in the case of the smartphone or tablet interface) to display the Upload a picture link. Click the link, navigate to the location of the photo you want to use, and click Open.

![Upload a picture](image)

**Figure 131: Upload a picture**

---

**Note:** Your profile picture is used by the Connect and legacy chat features as well if they are activated.

---

**Work with Live Feed messages**

This portion of the UI gives the user access to various types of messages and tools for grouping and categorizing messages. Also included are methods for identifying which user feeds you are following and which users are following you.
Table 107: Tools for working with live feed messages

<table>
<thead>
<tr>
<th>Menu section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>My Live Feeds</td>
<td>• My Live Feeds: These are custom feeds that allow you to customize live feed to view the content that is most important to you.</td>
</tr>
<tr>
<td>Company Feed</td>
<td>• Company Feed: This feed displays all posts, except those posted to private or unlisted groups.</td>
</tr>
<tr>
<td>Group Feeds</td>
<td>• Group Feeds: These feeds are created by users. Record Feeds: These feeds are associated with a record, such as an incident or change.</td>
</tr>
<tr>
<td>Record Feeds</td>
<td>• Record feeds: These feeds help users collaborate on records by providing a place for anyone who can access the record to share messages and post attachments specific to that record.</td>
</tr>
<tr>
<td>People</td>
<td>• People: This option displays people who are following the current user and people the current user is following.</td>
</tr>
<tr>
<td>Teams</td>
<td>• Teams: This option is used to combine users into groups for the purpose of subscribing to specifically-focused conversations.</td>
</tr>
<tr>
<td>Hashtags</td>
<td>• Hashtags: Hashtags are words marked with a hash (#) symbol in messages. Hashtags are used to categorize messages by keyword or topic for improved search results messages filtered from all conversations that include specific hashtags.</td>
</tr>
</tbody>
</table>

View another Live Feed user

When a requester user, one that has no ServiceNow role, is viewing a feed and points to another user’s picture, information for the user appears from the Business Card view of the User [sys_user] table.

You can customize ACLs to increase the amount of information you want displayed for users with different roles.
**Figure 132: View profile**

If you click a user's name or title, the user's profile appears. Click the tabs to view different types of information for the user.
Follow other Live Feed users

As you use Live Feed, you can follow the message threads of other users.

1. Navigate to a thread that the user you want to follow is engaged in.
2. Click that user's name or point to the user's picture.
   A Follow link appears in the user's profile.
3. Click Follow.
4. To stop following the user, navigate to People Following.
5. Click Unfollow.
6. To view people who are following you, navigate to People Followers.

Select feeds

A feed is a stream of related messages. You can use the feed selector to switch between feed types and to view specific group feeds and record feeds.

1. Use the Search field to locate any type of feed. As you type in the Search field, the results are dynamically displayed. For example, if you type INC, records that are incidents are forced to the top of the results list.
You can also select the following types of feed information.

<table>
<thead>
<tr>
<th>Feed</th>
<th>Description</th>
</tr>
</thead>
</table>
| My Live Feeds     | Displays the following posts:  
|                   | • messages from users you follow  
<p>|                   | • messages with hashtags you follow |
| Company Feed      | Displays all posts, except those posted to private or unlisted groups. |</p>
<table>
<thead>
<tr>
<th>Feed</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add Group Feed</td>
<td>Allows you to add a group feed.</td>
</tr>
</tbody>
</table>

Follow feeds

You can view users who are following you or other users you are following.
To view users who are following you or other users you are following, click People in the sidebar.
The system shows 10 most recent followers or users you are following.

![People](image)

*Figure 137: People*

If either list contains more than 10 users, a Show More link appears.

**Note:** If you are following a particular user whose profile changes, that user moves to the front of the Following list. This alerts you to changes in the profile of a user you are following.

Bookmark feeds and hashtags

The live feed interface uses the standard bookmarking functionality for feeds and hashtags.
In UI15, you can drag-and-drop group feeds and hashtags from the Feed Summary section to the Edge for quick access.
Add Live Feed to your homepage

You can add Live Feed to your own homepage or to a global homepage.

1. Navigate to a homepage.

2. Click the add content icon in top left corner of the homepage.

3. Select Live Feed in the left panel.

4. On the bottom of the window, click Add here in the appropriate layout position, then close the window.
Note: Administrators can add live feed to a global homepage to make it available for all homepage users by default. Users with any role can add live feed to their homepage; however, administrators can restrict this ability.

Post content in Live Feed

In Live Feed, you can post new messages and replies to existing messages for all users in the feed. You can also send a reply message to a team or record.

Post a live feed message

You can post a message to open a new feed.
1. Navigate to Collaborate Live Feed.
2. Click the feed to which you want to post your message, for example My Live Feed, Company Feed, and so on.
3. Enter a message in the Share your thoughts field. Use hashtags, if you want.
4. As needed, click to add a poll, attachment, or screenshot image, respectively.
5. Click Post.

Reply to a live feed message

To participate in an existing thread of a feed, you can compose and submit a reply message. By default, the message is visible to all members of the feed.
1. Navigate to Collaborate Live Feed.
2. Locate the message you want to reply to.
3. Type your reply in the message box and click Reply.
   As needed, you can add hashtags, attachments, links, or knowledge base articles.
4. To limit who can view the reply to a single individual, select a user from the To choice list.
5. Click Reply.
6. By default, 7 replies are visible for each message. To view additional replies, click Show all replies. Any reply to a reply includes a Threads link.
7. Click Threads to view all of the replies within the selected reply in reverse chronological order within the Message Thread pop-up window, similar to an email thread.
Message Thread

**Navakanth Reddy #suggestion(s)** A common black vertical line just before the bars would help with this. Also, line spacing between two options should be more than single-spaced.

Also, the bar says 5 people voted and it shows up 5 people and 1 more. Is this a #bug?

8 days ago • in reply to Nirupam Biswas • Like (1) • Reply • Share • Tags (2)

**Nirupam Biswas** I guess we need some visual distinction between the poll question and the options. After voting, I got confused for some moments why there are four options in result. See screenshot.

8 days ago • Like (1) • Reply • Share • Tags

**Shouvik Goswami** We have enabled polls in Live Feed. Please review and provide #suggestions and #feedbacks

How do you like the poll in Live Feed?

- Exactly what I was looking for
- Wanted something more
- Did not visualize it this way

8 days ago • Like (1) • Reply • Share • Tags (2)
Attach files, links, images, and knowledge articles to messages

In addition to entering text, you can attach files, such as images, documents, and spreadsheet files in any ServiceNow supported file type to live feed messages.

Administrators can manage attachment file settings, such as supported file types and maximum attachment file size, by editing system properties.

You can also include links to user-defined URLs and knowledge articles contained in your instance's knowledge base.

Note: The functionality described here applies to HTML5-compliant browsers, such as Chrome, Firefox, Safari and Internet Explorer 10 and above. Significant differences while using different browsers are highlighted.

Attach a file to a post or reply

You can attach files to a post by dragging a file into a post or pasting an image from the clipboard.

Use the paperclip icon ( ) to drag files into a post. Additionally, you can paste images into a post or reply from the clipboard.

1. Do one of the following:
   - While composing a post or reply (see Reply to a Message), locate one or more images or other supported types of files, and drag them into the message box.
   - Click the paperclip icon in the message box, navigate to the location of the files you want to attach, select them, and click Open.

2. To add more files, drag-and-drop additional files into the text box below the displayed files or images, or click the plus sign.
3. If you want to delete an attachment before posting the message, click the trashcan icon adjacent to the attachment.

4. Enter a comment to share your thoughts about the image.

   **Note:** The Post button is enabled only after you add the comment.

5. Click Post or Reply.

6. If you added files that do not contain previews and then posted the message, they will be listed in the message box with a Download link.
7. Click the link to download the files.

Copy an image from the clipboard

In addition to adding files to a message, you can also copy images to the clipboard and paste them into a message or reply.

1. Click into the Comment box and add a comment.

   ![Image]

   **Figure 142: Copy paste**

2. Click the Add an image button. The Screenshots dialog box opens.
3. Right-click the Paste an image here box and select Paste to paste the image from the clipboard.
Figure 143: Copy pasted

4. To add another image, repeat the previous steps.
5. When you finish pasting images into the message, click Done.
6. To change the link text, click Pasted Image and enter a new label.
7. When you finish, click Post or Reply.
8. To remove an image, click the trash can icon adjacent to the link.
9. To make changes to an existing image, click the edit icon ( ).
Add a link to a post or reply

Add or modify a link to a live feed post.

1. Click into the Comment box.
   The Add a link button appears.
2. Click the Add a link button.
   The URL and Link text fields appear.

3. Enter the URL and the text you want to appear as the link.
4. To add another link, click the link icon under the URL field.
5. When you have finished entering your message, click Post or Reply.
To remove a link, click the trash can icon adjacent to the link. To make changes to an existing link, click the edit ( ) icon.

Add a knowledge article link to a post or reply

Use the ID of a knowledge article to post it as a reply to a live feed conversation.

1. While composing a post or reply, type the ID of the knowledge article you want to link to. You do not need to identify the knowledge article ID as a hyperlink; live feed recognizes it as such and automatically converts it into a link when the message is posted.

2. When you are finished entering your message, click Post or Reply.

Add a poll to a message

When you are posting a message, you have the option of creating a poll in order to record your viewers' opinions. As users take the poll, their feedback statistics are displayed within the feed.

1. Open the feed where you want to create a message with a poll.

2. Enter the message with an invitation to take the poll in the Share your thoughts box.

3. Click the poll ( ) icon.
In the Question field, enter the question on which you are soliciting opinions.

In the Option fields, enter possible responses to the query.

To add more response options, click Add more options.

Click Post.

After the poll is posted, users who view the message can vote. After they vote, their pictures appear next to their response, with others who have voted for the same option.

**Note:** Only the poll creator can view results without casting a vote. Other members can see results only after casting a vote or if the poll is closed.
An email notification with the poll result is sent to all participants of the poll informing them that the poll is closed.

Add mentions to a message

An @mention is any posted update that contains @username anywhere in the body of the message. The user’s name, with a link to that user’s feed, is inserted into the message. Additionally, the mentioned user receives an email notification about the mention. This is a great way of bringing attention to other members in a conversation. All @mentions are included in the logged-in user’s My Feed.

**Note:** If an @mention is used by a member of a team, only members of that team appear in the auto-suggest list.

1. While entering a message or reply in a conversation, type @username anywhere in the message. As you type, an auto-suggest list appears with names and pictures of users that match your entries. For example, if you type @t, the auto-suggest list shows the pictures and names of all users with names that start with T.
2. Click the user you want to add.
   That user's name is inserted into the @mention in the body of the message.

   **Note:** My Feed displays @mentions of you and the teams you are a member of. Profile feeds for another user display only @mentions of that user.

---

**Like a message**

Like a message to provide feedback to the author.

1. Navigate to Collaborate Live Feed.
2. Click Feeds.
3. Locate the feed that contains the message you want to like.
4. Under the message title, click Like.
   If the message has previously been liked, the number of likes for a message displays next to the Like link.

   For a top-level message, the profile pictures of the first 5 users who liked a message are displayed. Any additional users who liked the message can be viewed by hovering over the # more link. If the logged-in user has liked the message, that user's image will appear first, followed by the image of the user who last liked the message.

   For a reply, you must hover your mouse pointer over the count link to view the users who liked the message.

   **Note:** After a message has been liked, it cannot be unliked.

---

**Delete a message**

Users can delete any of their own posts or replies. A conversation administrator can also delete messages.

1. Hover over the message you want to delete.
2. Click the trash can icon in the upper-right-hand corner of the message box.
3. Click Delete in the confirmation box.
   The message disappears from the feed.

Notifications

Notifications keep users informed of events that concern them. The system can notify users by email, SMS text message, or push notification.

Explore

- Notifications release notes
- Upgrade to London
- Domain separation and Notifications on page 647

Email

- Basic email setup on page 598
- Advanced email setup on page 600
- Create an email notification on page 649
- The email client on page 772
- System mailboxes on page 772
- Inbound email actions on page 732
- Email digests

Push Notifications

- Push notifications on page 789
- Push notification setup with the ServiceNow mobile application on page 797
- Push notification setup with a custom push application on page 804

Subscription-based notifications

- Create notification channels on page 826
- Modify notification channels on page 828
- Create personal notifications on page 832

Notifications in messaging applications

- Setup
  - Configure message content on page 861
  - Create a messaging notification on page 863
  - Link your ServiceNow user account to your Slack or MS Teams account for Now Actions on page 868
  - Configure your notification system settings for the third-party messaging apps

Troubleshoot and get help

- Ask or answer questions in the Platform community
- Search the HI knowledge base for known error articles
- Contact ServiceNow Support

Email and SMS notifications

Use email notifications to send selected users email or SMS notifications about specific activities in the system, such as updates to incidents or change requests.

Email notifications allow administrators to specify:

- When to send the notification
- Who receives the notification
- What content is in the notification
- Whether the notification can be delivered in an email digest and if so, the digest content
Additional email notification options are available. Users can subscribe to notifications, and administrators can make some notifications mandatory.

Administrators also have the option of converting existing email notifications to a rich HTML format. This format provides several advantages, including:

- Raw HTML content is converted into a WYSIWYG format.
- The content can be edited in a feature-rich HTML editor.
- Mail scripts are condensed into a single, easy-to-read line that can be reused in multiple email notifications.
- To prevent broken links, items like images and incidents, that are linked with URLs relative to an instance are converted to absolute links. For example, if an incident is linked using a relative URL, the link is converted to an absolute link.

**Note:** The rich HTML format is the default for all new email notifications.

**Note:** Instances cannot send or receive encrypted email messages. The system strips out the body of the encrypted email because it cannot process the encrypted content in plain text or HTML.

If you want to change how the instance processes incoming email, see Inbound email actions on page 732. See Email logs for examples of messages the system displays when notifications or inbound email actions are not processed.

**Email setup**

All email notifications use the email properties that you define for your instance and the email accounts that you set up. Your email service can also affect the successful transmission of incoming and outgoing email.

**Email accounts**

Email administrators set up email accounts to allow the system to connect to external mail services such as POP3, SMTP, or IMAP servers. You can use the ServiceNow-provided email accounts or create your own accounts for your own email services.

**Email properties**

Use Email Properties to configure settings for inbound and outbound email. Email properties apply to all email accounts.

**Email service size restrictions**

Your email service, whether you are using a standard ServiceNow email configuration or an alternate email configuration, determines the successful transmission of incoming or outgoing emails based on a maximum email size. An email configuration consists of your instance, email server, and email client.

- **Standard email configurations** – For instances that use the standard email configuration, the ServiceNow mail servers cannot send or receive emails larger than approximately 50 MB (before encoding), including the email header, body text, and attachments. Email messages are encoded by an email client, which increases total email message size. The maximum ServiceNow mail server size restriction is 75 MB (after encoding). The maximum email size limit is enforced regardless of any configured attachment size limits.
• **Alternate email configurations** – If your email service uses a company-owned or third-party server, the approximate size restriction of 50 MB (including the email header, body text, and attachments) may still apply. However, your service might support different maximum total file sizes for inbound and outbound emails. Check with the email administrator of your email service to verify email size limits.

For details on how encoding can affect email message size and email transmission, see [KB0521772](#).

**Email service availability**

Email service is intentionally shut down on instance clones to prevent resending already delivered email. Upgrades no longer require an extended interruption of email service. Instances continue to process email during an upgrade. For a possible explanation for undelivered emails, see the blog post *Whitelisting emails sent from the ServiceNow infrastructure* by a ServiceNow Technical Support Engineer in the ServiceNow Community.

For instructions on creating and sending custom emails when events on the instance occur, see the tasks in *Email and SMS notifications* on page 596.

**Instance-to-instance communication via email**

Use *Web services* to communicate between two instances.

**Basic email setup**

All production instances can send and receive email using ServiceNow-provided resources. The instance has an email address of instance@service-now.com.
Network layout for standard email configuration
Basic email services and features

- Mail servers maintained by ServiceNow.
  - Encrypt mail with opportunistic TLS (Transport Layer Security) if supported by your mail servers.
    If your internal mail servers send and receive messages via a TLS-encrypted channel, ServiceNow mail servers support that communication.
  - Provide a dedicated mailbox for your instance.
- Pre-configured email accounts to connect to ServiceNow mail servers.
  - An SMTP account sends email to your primary Mail Exchange (MX) server from your instance email address of instance@service-now.com.
  - A POP3 account receives email sent to your instance email address of instance@service-now.com.
- High availability features from ServiceNow datacenters.
- Spam detection for incoming email.

Administrators who want to use basic email services can do so by enabling the email properties for sending and receiving email.

*Enable basic email*
Enable basic email to use ServiceNow-provided email servers and accounts.

Role required: admin

1. Navigate to System Properties Email.
2. Configure these email properties and click Save.

<table>
<thead>
<tr>
<th>Property section</th>
<th>Label</th>
<th>System property</th>
<th>Setting required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outbound Email Configuration</td>
<td>Email sending enabled</td>
<td>glide.email.smtp.active</td>
<td>Yes</td>
</tr>
<tr>
<td>Inbound Email Configuration</td>
<td>Email receiving enabled</td>
<td>glide.email.read.active</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Advanced email setup

With an advanced email setup, you can use your own SMTP server, POP3 server, or both.

Setting up your own email environment can be useful if you want to use existing filtering, retention, or compliance aspects of your internal email architecture. You can set up email in several ways:

- Use your own SMTP server to forward email to ServiceNow servers.
- Use your own SMTP server to send email.
- Use your own POP3 server to receive email.
- Use your own SMTP and POP3 servers to send and receive email.
- Use an OAuth 2.0-enabled SMTP server to send email from a third-party service.
- Use an OAuth 2.0-enabled IMAP server to receive email from a third-party service.

The following procedures assume that you *enabled basic email properties.*
Enable using your own SMTP server
You can use your own SMTP server to forward email to the ServiceNow-provided email address and to send email from the instance.

- Role required: admin
- Email server required: SMTP
- Basic email properties: enabled

Typically, organizations use a custom email address to change the reply-to address from the instance name to a custom email address within their domain. Configure the SMTP server in your internal email architecture to forward email from the custom email address to the instance email address. Implement a spam filter on the custom email address.

1. To receive email sent to a custom address, configure your SMTP server to forward email sent to the custom address to the instance email address.
   For example, forward mail sent to service-desk@company.com to instance@service-now.com.
2. Navigate to System Mailboxes Administration Email Accounts. The system displays the list of available email accounts.
3. Locate the record for ServiceNow SMTP and change Active to false.

![Email Accounts Table]

4. Click New.
5. Create an email account record for your SMTP server where the Type is SMTP.
6. From Related Links, click Test SMTP connection.
   If the email account is valid, the system returns a Completion code of Success.

![Test SMTP Connection Result]
Figure 149: Sending email using your own SMTP server

- **Outbox with Email To:** user@yourdomain.com
- **Inbox For:** instance@service-now.com

**Send**

- **Domain Name System (DNS)**
  - Lookup Mail Server For: yourdomain.com
  - mx.yourdomain.com

**Receive**

- **ServiceNow Incoming Mail Server**
  - pop.service-now.com
  - Route To Mailbox For: instance@service-now.com

**Domain Name System (DNS)**
- Lookup Mail Server For: service-now.com
- mx.service-now.com

- **Your Outbound Mail Server**
  - smtp.yourdomain.com
  - Sends Email To: user@yourdomain.com

- **Your Incoming Mail Server**
  - pop.yourdomain.com
  - Route To Mailbox For: user@yourdomain.com

- **Email**
  - Passes Your Spam Filter? Yes / No

- **User Email Account**
  - Outbox with Email To: helpdesk@yourdomain.com

- **Stop**
Enable using your own POP3 server
You can use your own POP3 server to store and receive email for the instance.

- Role required: admin
- Email server required: POP3
- Basic email properties: enabled

1. On your POP3 server, create a mailbox for your instance that has a custom email address. For example, create a mailbox for service-desk@company.com.
2. Navigate to System Mailboxes Administration Email Accounts. The system displays the list of available email accounts.
3. If you do not want to receive email sent to the instance@service-now.com mailbox, locate the record for ServiceNow POP3 and change Active to false.

An instance can receive email from multiple POP3 accounts at the same time. Leaving the ServiceNow POP3 account active allows the instance to receive email sent to the instance default email address.

4. Click New.
   The system displays a blank Email Account form.
5. Create an email account record for your POP3 server where the Type is POP3.
6. From Related Links, click Test POP3 connection.
   If the email account is valid, the system returns a Completion code of Success.
<table>
<thead>
<tr>
<th>Name</th>
<th>Testing POP3 connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>State</td>
<td>Complete</td>
</tr>
<tr>
<td>Completion code</td>
<td>Success</td>
</tr>
<tr>
<td>Message</td>
<td>Testing complete</td>
</tr>
</tbody>
</table>

`Return to Email Account`
Figure 150: Receiving email using your own POP3 server

ServiceNow Instance
Outbox with Email To:
user@yourdomain.com

Inbox For:
helpdesk@yourdomain.com

Send

ServiceNow Outbound Mail Server
relay
Sends Email To:
user@yourdomain.com

Receive

Domain Name System (DNS)
Lookup Mail Server For:
yourdomain.com
mx.yourdomain.com

Your Incoming Mail Server
pop.yourdomain.com
Route To Mailbox For:
helpdesk@yourdomain.com

Your Outbound Mail Server
smtp.yourdomain.com
Send Email To:
helpdesk@yourdomain.com

Your Incoming Mail Server
pop.yourdomain.com
Route To Mailbox For:
user@yourdomain.com

Email Passed Your Spam Filter?

Stop

Receive

User Email Account
Outbox with Email To:
helpdesk@yourdomain.com

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Enable using your own SMTP and POP3 servers
You can use your own SMTP and POP3 servers to send email from the instance and to store and receive email for the instance.

- Role required: admin
- Email servers required:
  - SMTP
  - POP3

- **Basic email properties:** enabled

1. On your POP3 server, create a mailbox for your instance. For example, create a mailbox for service-desk@company.com.
2. Navigate to System Mailboxes Administration Email Accounts. The system displays the list of available email accounts.
3. Locate the record for ServiceNow SMTP and change Active to false.

   ![Email Accounts Table]

4. If you do not want to receive email sent to the instance@service-now.com mailbox, locate the record for ServiceNow POP3 and change Active to false.

   An instance can receive email from multiple POP3 accounts at the same time. Leaving the ServiceNow POP3 account active means that the instance receives email sent to its default email address.
5. Click New.
The system displays a blank Email Account form.
6. Create an email account record for your SMTP server where the Type is SMTP.
7. From Related Links, click Test SMTP connection.
   If the email account is valid, the system returns a Completion code of Success.

8. Click New.
The system displays a blank Email Account form.
9. Create an email account record for your POP3 server where the Type is POP3.
10. From Related Links, click Test POP3 connection.
    If the email account is valid, the system returns a Completion code of Success.
<table>
<thead>
<tr>
<th>Name</th>
<th>Testing POP3 connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>State</td>
<td>Complete</td>
</tr>
<tr>
<td>Completion code</td>
<td>Success</td>
</tr>
<tr>
<td>Message</td>
<td>Testing complete</td>
</tr>
</tbody>
</table>

[Return to Email Account]
**OAuth email authentication**

OAuth enables your instance to receive and send email through a third-party email account.

Open Authentication (OAuth) is an open standard for authorization that provides administrators with an authorization method when connecting to incoming IMAP and outgoing SMTP servers. OAuth enables an instance to receive and send email from a third-party account, such as Gmail, without having to enter the credentials for that account.

The OAuth 2.0 implementation requires you to obtain an access and refresh token from your third-party email provider for each third-party email account. The tokens are automatically saved to the instance database. They provide authorization for all email communication between the instance and the authorized third-party account. A scheduled job regularly checks to see if email access tokens are valid. If the access token is not valid, but the refresh token is, the instance automatically regenerates a new access token.

OAuth 2.0 support is available starting with the Geneva release. The OAuth implementation supports IMAP and SMTP accounts only. POP3 is not supported. OAuth 1.0 is no longer supported.

---

**Note:** Customer email accounts configured to use OAuth 1.0 authentication with Gmail cease to function as of April 20, 2015. See [KB0546976](mailto:KB0546976) for more information.

---

Activating the Email - OAuth support for IMAP and SMTP plugin allows you to use OAuth with email. If you upgrade to Geneva or later instances and are already using OAuth 1.0, activate the plugin again.

See [Outbound REST with OAuth 2.0 profile tutorial - integrating with Google Contacts API](https://github.com/ServiceNow/now-platform/blob/master/docs/examples/outbound_rest_oauth2_examples.md) for an example of using an OAuth 2.0 profile to authenticate an outbound REST message with Google to retrieve contact information. Also see [OAuth 2.0](https://developer.mozilla.org/en-US/docs/Web/Security/OAuth) for more information on OAuth 2.0 support in the instance.

---

Activate the OAuth email authentication plugin

OAuth email authentication requires the Email - OAuth support for IMAP and SMTP plugin.

Role required: admin

1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.
   - If the plugin depends on other plugins, these plugins are listed along with their activation status.
   - If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).
4. If available, select the Load demo data check box.
   - Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.
   - You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.
5. Click Activate.

---

Enable OAuth 2.0 for email

Setting up OAuth 2.0 for email requires you to obtain access and refresh tokens from your email provider.

- Role required: admin
- Plugin required: Email - OAUTH support for IMAP and SMTP

1. Log in to your third-party email account, such as Gmail, and enable OAuth 2.0.
2. Obtain the following from your third-party email account:
   - client ID
- client secret
- authorization URL
- token URL
- redirect URL
- token revocation URL

3. Navigate to System OAuth Application Registry.
4. Click New.
5. Click Connect to a third party OAuth Provider to create an application registry record that email uses.
6. Use the information you obtained from your third-party email account to fill in the fields on the form. See Use a third-party OAuth provider for instructions. Create the OAuth application registry record and its associated OAuth Entity Profile and OAuth Entity Scope records.
7. Click Submit.
8. Navigate to System Mailboxes Administration Email Accounts. The system displays the list of available email accounts.
9. If you do not want to receive email sent to the default instance email address, locate the record for ServiceNow POP3 and change Active to false. The system can receive email from multiple POP3 email accounts.
10. Locate the records for ServiceNow SMTP and change Active to false.

<table>
<thead>
<tr>
<th>Email Accounts</th>
<th>New</th>
<th>Go to</th>
<th>Name</th>
<th>Search</th>
<th>Active</th>
<th>Type</th>
<th>Server</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>ServiceNow POP3</td>
<td></td>
<td>false</td>
<td>POP3</td>
<td>pop3</td>
<td>110</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ServiceNow SMTP</td>
<td></td>
<td>false</td>
<td>SMTP</td>
<td>relay</td>
<td>25</td>
</tr>
</tbody>
</table>

11. Click New. The system displays a blank Email Account form.
12. Create an email account record for your OAuth 2.0 SMTP server where the Type is SMTP.
13. For Authentication, select OAuth 2.0.
14. For OAuth Profile, select the application registry record you created.
15. Click Authorize Email Account Access to obtain the access and refresh tokens.
   Another browser window opens asking you to authorize the account access on the third-party email account.
16. Authorize the access.
After the authorization is successful and the tokens are saved to the instance, the Authorize Email Account Access button no longer appears on the Email Account form.

17. Click New.
   The system displays a blank Email Account form.

18. Create an email account record for your OAuth 2.0 IMAP server where the Type is IMAP.
   Use the same Authentication and OAuth profile settings as the OAuth SMTP email account.

Email accounts

Email accounts store the connection details and credentials the system uses to access external email servers and services.

By default, instances come with email accounts for ServiceNow-managed SMTP and POP3 servers to send and receive email. These accounts cannot be modified, but can be deactivated if you do not want to use them. To connect to other email servers and services you must create email accounts for them. You can create email accounts for servers and services that use these protocols:

- SMTP
- POP3
- IMAP

**Note:** The system only allows one SMTP email account to be active at a time and sends all email through this account. You can however receive email from multiple POP3 or IMAP accounts.

The system stores individual email accounts in the sys_email_account table. Create separate email accounts to send and receive email. Use *email properties* to define how the system processes email for all email accounts.

By default, the ServiceNow POP3 server provides each instance with its own mailbox at the address instance@service-now.com. Likewise, the ServiceNow SMTP server sends email from the address instance@service-now.com. To create another mailbox, provision your own POP3 or IMAP server and create an email account to the server on the instance. To change the sent from email address, update the address in the email account you use for sending email.
Figure 152: A ServiceNow configured email account

Configure an email account
You can create email accounts in addition to the accounts provisioned for you.

- Role required: admin
- Email server: a compatible email server
  - SMTP
  - POP3
1. Navigate to System Mailboxes Administration Email Accounts.
2. Click New.
3. Fill in the fields on the form (see table).

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name to identify this Email Account.</td>
</tr>
<tr>
<td>Type</td>
<td>Mail server type. The choices are:</td>
</tr>
<tr>
<td></td>
<td>• Email Reader</td>
</tr>
<tr>
<td></td>
<td>• POP3</td>
</tr>
<tr>
<td></td>
<td>• IMAP</td>
</tr>
<tr>
<td></td>
<td>• Email Sender</td>
</tr>
<tr>
<td></td>
<td>• SMTP (only one active account permitted)</td>
</tr>
<tr>
<td>Authentication</td>
<td>The type of authentication used for the email account to connect to the email server. The choices are Password, OAUTH, and OAUTH 2.0. The Email - OAuth support for IMAP and SMTP plugin must be active for the OAuth options to be visible.</td>
</tr>
<tr>
<td>OAuth Provider</td>
<td>Select the OAuth application registry record for this account. This field appears if you selected OAuth 2.0.</td>
</tr>
<tr>
<td>Server</td>
<td>Remote Server to which this account connects.</td>
</tr>
<tr>
<td>Active</td>
<td>Determines if this Email Account is active.</td>
</tr>
<tr>
<td>ServiceNow Configured</td>
<td>Indicates if this account is provisioned by ServiceNow. This field is read-only. If you create an account, this option is not selected.</td>
</tr>
<tr>
<td>Email user label</td>
<td>A display value used for outgoing messages. This field is for SMTP type accounts only.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>-------------</td>
</tr>
<tr>
<td>User name</td>
<td>The user name or ID to authenticate an email address. The value in this field is also the From address when the instance sends email. If you are using SMTP, this must be a full email address. The value in the From field can override this (for SMTP accounts). <strong>Note:</strong> The address in the From field on the Notification form takes precedent over this field.</td>
</tr>
<tr>
<td>Password</td>
<td>Password when Authentication type is Password. <strong>Note:</strong> You may need to increase the size of this field to accommodate longer passwords. By default, this field has a size of 40.</td>
</tr>
<tr>
<td>From</td>
<td>(SMTP only) The from address used for notifications sent with this account. This address takes precedence over the User name field. If nothing is present in this field, the User name is used as the return address for notifications sent from the instance.</td>
</tr>
<tr>
<td>Enable SSL</td>
<td>Enables Secure Socket Layers when connecting to an Email Server.</td>
</tr>
<tr>
<td>Enable TLS</td>
<td>Enables Transport Layer Security when connecting to an Email Server.</td>
</tr>
<tr>
<td>Port</td>
<td>Connection TCP port.</td>
</tr>
</tbody>
</table>
4. Click Submit.
5. Click the test connection link at the bottom to test the SMTP, POP3, or IMAP account.

The system displays a pop-up window with the results of the connection test.
If the test succeeds, click Close to return to the email account record. If the test fails, click View Logs to display more information about the test results.

The system uses the email account to send or receive email.
Enable the system to send or receive email.

Email properties
The Email Properties page is where you can configure settings for inbound and outbound email.
Email properties are available from either of these modules:
- System Mailboxes Email Properties
- System Properties Email Properties
### Email Properties

Email accounts can be created or modified in the Email Accounts table. Email account connection status and diagnostics information can be found on the Email Diagnostics page.

#### Outbound Email Configuration

- **Email sending enabled**
  - Yes | No
- **Send all email to this text email address (non-production testing)**
  - <text>
- **Append timezone to dates and times in sent email**
  - Yes | No
- **Create visible watermark in sent email. If false, create invisible watermark via hidden div tag.**
  - Yes | No
- **Resend email if server returns these SMTP error codes**
  - 421, 450, 451, 452
- **Do not resend email if server returns these SMTP error codes**
  - 500, 501, 502, 503, 504, 505, 506, 507, 508, 509
- **Resend email when server returns unknown SMTP error codes.**
  - Yes | No
- **Notify that can view email in the Activity formatter when including “Sent/Received Emails”**
  - [ ]
- **Number of journal entries (Additional comments, Work notes, etc.) included in email notifications (-1 means all).**
  - 3

#### Inbound Email Configuration

- **Email receiving enabled**
  - Yes | No
- **Identify email as a reply to these subject prefixes**
  - re:_Auto reply: Accepted, Tentative, Declined:
- **Identify email as a forward by these subject prefixes**
  - [ ]
- **Tos, From:**
  - <text>
- **Discard everything below this line if found in a reply body (comma separated, case sensitive)**
  - <text>
- **Ignore email with these headers (comma separated, case sensitive)**
  - X-ServiceNow-Flag, X-ServiceNow-Virus, INFECTED, Au
- **Ignore email when subject starts with text (comma separated, case insensitive)**
  - <text>
- **Ignore email from these senders. Use the name before the @ sign, (comma-separated)**
  - mailer-daemon, postmaster
- **Automatically create users for incoming emails from trusted domains**
  - Yes | No
- **Default password for users created from email sent from trusted domains. (must reset upon login).**
  - <text>
- **Trusted domains when creating new users from incoming email (ignore email from untrusted domains unless from an existing user, use * for all domains)**
  - *
Email accounts are configured in the System Mailboxes Administration Email Accounts module, starting with the Geneva release. See Configure an email account on page 615 for instructions.

Email diagnostics are available from the System Mailboxes Email Diagnostics module, starting with the Geneva release.

**Outbound mail configuration**

The Outbound Mail Configuration section of the Email Properties page contains properties for sending email.
### Outbound Email Configuration

<table>
<thead>
<tr>
<th>Setting</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email sending enabled</td>
<td>Yes</td>
</tr>
<tr>
<td>Send all email to this test email address (non-production testing)</td>
<td></td>
</tr>
<tr>
<td>Append timezone to dates and times in sent email</td>
<td>Yes</td>
</tr>
<tr>
<td>Create visible watermark in sent email. If false, create invisible watermark via hidden div tag.</td>
<td>Yes</td>
</tr>
<tr>
<td>Resend email if server returns these SMTP error codes</td>
<td>421,450,451,452</td>
</tr>
<tr>
<td>Do not resend email if server returns these SMTP error codes</td>
<td>500,501,502,503,504,550,551,552,553,554</td>
</tr>
<tr>
<td>Resend email when server returns unknown SMTP error codes</td>
<td>Yes</td>
</tr>
<tr>
<td>Roles that can view email in the Activity formatter when including &quot;Sent/Received Emails&quot;</td>
<td></td>
</tr>
<tr>
<td>Number of journal entries (Additional comments, Work notes, etc.) included in email notifications (-1 means all)</td>
<td>3</td>
</tr>
</tbody>
</table>
### Table 111: Outbound email properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Label</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.email.smtp.active</td>
<td>Email sending enabled</td>
<td>Specifies whether to enable or disable the outgoing mail server.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td>glide.email.test.user</td>
<td>Send all email to this test email address (non-production testing)</td>
<td>Specifies the comma-separated list of email addresses to which the instance sends all email messages. Typically used in non-production instances for testing purposes.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: none</td>
</tr>
<tr>
<td>glide.email.append.timezone</td>
<td>Append time zone to dates and times in sent mail</td>
<td>Specifies whether to append the system time zone to date and date/time values in outbound emails. For example, 2010-07-02 04:01:14 PST.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td>glide.email.watermark.visible</td>
<td>Create visible watermark in sent mail. If false, create invisible watermark via hidden div tag.</td>
<td>Indicates whether the watermark in email notifications is visible (true) or wrapped in a hidden div tag (false).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: false</td>
</tr>
<tr>
<td>glide.smtp.defer_retry_ids</td>
<td>Resend email if server returns these SMTP error codes</td>
<td>Specifies the comma-separated list of SMTP error codes that force the instance to resend email.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 421,450,451,452</td>
</tr>
<tr>
<td>glide.smtp.fail_message_ids</td>
<td>Do not resend email if server returns these SMTP error codes</td>
<td>Specifies the comma-separated list of SMTP error codes that prevent the instance from resending email.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 500,501,502,503,504,550,551,552,553,554</td>
</tr>
</tbody>
</table>
### London ServiceNow Now Platform Capabilities

<table>
<thead>
<tr>
<th>Property</th>
<th>Label</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.smtp.default_retry</td>
<td>Resend email when server returns unknown SMTP error codes.</td>
<td>Enables (true) or disables (false) resending email when an unknown SMTP error code is encountered. The instance only recognizes the SMTP error codes defined in the glide.smtp.defer_retry_ids property.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td>glide.ui.activity.email_roles</td>
<td>Roles that can view email in the Activity formatter when including &quot;Sent/Received Emails&quot;</td>
<td>Specifies the comma-separated list of roles that can view email in the activity formatter.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: itil</td>
</tr>
<tr>
<td>glide.email.journal.lines</td>
<td>Number of journal entries (Additional comments, Work notes, etc.) included in email notifications (-1 means all).</td>
<td>Specifies the number of entries from a journal field, such as Additional comments or Work notes, included in email notifications. A value of -1 includes all journal entries.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Learn More: Restrict the Number of Entries Sent in a Notification</td>
</tr>
</tbody>
</table>

**Inbound mail configuration**

The Inbound Mail Configuration section of the Email Properties page contains properties to control inbound email.
Inbound Email Configuration

Email receiving enabled

Yes | No

Identify email as a reply by these subject prefixes

re:,aw:,r:,Accepted:,Tentative:,Declined:

Identify email as a forward by these subject prefixes

fw:,fwd:

Discard everything below this text if found in a reply body (comma separated, case sensitive)

\n\n-----Original Message-----,\n\nFrom:

Ignore email with these headers (comma separated name:value pairs)

X-ServiceNow-Spam-Flag:YES,X-ServiceNow-Virus:INFECTED,Auto-Subn

Ignore email when subject starts with text (comma separated, case insensitive)

out of office autoreply, undeliverable:, delivery failure:, returned mail:, a

Ignore email from these senders. Use the name before the @ sign. (comma-separated)

mailer-daemon, postmaster

Automatically create users for incoming emails from trusted domains

Yes | No

Default password for users created from email sent from trusted domains. (must reset upon login)

password
<table>
<thead>
<tr>
<th>Property</th>
<th>Label</th>
<th>Description</th>
</tr>
</thead>
</table>
| glide.email.read.active | Email receiving enabled | Specifies whether to enable or disable the inbound mail server.  
  - Type: true | false  
  - Default value: true |
| glide.email.reply_subject_prefix | Identify email as a reply by these subject prefixes | Specifies the comma-separated list of prefixes in the subject line that identify an email reply.  
  - Type: string  
  - Default value: re:, aw:, r:, Accepted:, Tentative:, Declined: |

**Note:** The case of the reply prefix in the email, for example RE:, must exactly match the case of the prefixes defined in this property. If, for example, an email contains the Re: prefix and only RE: is defined in the property, the email will not be recognized as a reply. Therefore, it is a best practice to define multiple versions of the prefix, including mixed-case versions, such as RE:, Re:, and so on.
<table>
<thead>
<tr>
<th>Property</th>
<th>Label</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.email.forward_subject_prefix</td>
<td>Identify email as a forward by these subject prefixes</td>
<td>Specifies the comma-separated list of prefixes in the subject line that identify a forwarded email.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: fw:, fwd:</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> The case of the forward prefix in the email, for example fw:, must exactly match the case of the prefixes defined in this property. If, for example, an email contains the Fwd: prefix and only fwd: is defined in the property, the email will not be recognized as a forward. Therefore, it is a best practice to define multiple versions of the prefix, including mixed-case versions, such as FWD:, Fwd:, and so on.</td>
</tr>
<tr>
<td>glide.pop3.reply_separators</td>
<td>Discard everything below this text if found in a reply body (comma separated, case sensitive)</td>
<td>Specifies the comma-separated list of separators that cause the instance to disregard everything below the text string in the message body. This list is case sensitive.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: \n\n-----,\n\n_____</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Original Message-----,\n\n_____ \n\nFrom:</td>
</tr>
<tr>
<td>Property</td>
<td>Label</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>glide.pop3.ignore_headers</td>
<td>Ignore email with these headers (comma separated name:value pairs)</td>
<td>Specifies the comma-separated list of email headers that cause the instance to ignore an email message. Use the format name:value to specify email header types and values. You can use a wildcard (<em>) for the subtype. For example, Content-Type:multipart/</em>; report-type=delivery-status; ignores emails containing a type of multipart and a value of report-type=delivery-status. For syntax specifications, see <a href="http://www.w3.org/Protocols/rfc1341/4_Content-Type.html">http://www.w3.org/Protocols/rfc1341/4_Content-Type.html</a>.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: string</td>
</tr>
</tbody>
</table>

**Note:** If the Email Filters plugin is activated, the Ignore header email filter overrides this property. The property does not appear on the Mail Properties page when email filters are enabled.
<table>
<thead>
<tr>
<th>Property</th>
<th>Label</th>
<th>Description</th>
</tr>
</thead>
</table>
| glide.pop3.ignore_subjects | Ignore email when subject starts with text (comma separated, case insensitive) | Specifies the comma-separated list of strings that cause the instance to ignore an email message if the string is present at the start of a subject line. These values are not case sensitive.  
  • Type: string  
  • Default value: out of office autoreply, undeliverable:, delivery failure:, returned mail:, autoreply  
  
  **Note:** If the Email Filters plugin is activated, the Ignore subject email filter overrides this property. The property does not appear on the Mail Properties page when email filters are enabled |
| glide.pop3.ignore_senders | Ignore email from these senders. Use the name before the @ sign. (comma-separated) | Specifies the comma-separated list of senders that cause the instance to ignore an email message. Enter only the name before the at sign (@).  
  • Type: string  
  • Default value: mailer-daemon, postmaster  
  
  **Note:** If the Email Filters plugin is activated, the Ignore sender email filter overrides this property. The property does not appear on the Mail Properties page when email filters are enabled |
<table>
<thead>
<tr>
<th>Property</th>
<th>Label</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.pop3readerjob.create_caller</td>
<td>Automatically create users for incoming emails from trusted domains</td>
<td>Controls the behavior when an instance receives an email from an email address not associated with a user record. If this property is set to true, the instance creates a new user record for the email address and places that new user in the Caller field of any tickets created. If the property is set to false, the instance places Guest in the Caller field of any tickets created.</td>
</tr>
<tr>
<td>glide.user.default_password</td>
<td>Default password for users created from email sent from trusted domains. (must reset upon login)</td>
<td>Specifies the password for new users created from incoming email. Users must reset the password at first login.</td>
</tr>
<tr>
<td>glide.user.trusted_domain</td>
<td>Trusted domains when creating users from incoming email.</td>
<td>Comma-separated list of trusted domains for which the instance automatically creates a guest user based on incoming emails. Use an asterisk (*) to trust all domains. If an email is not from a trusted domain, the instance processes the inbound email as a &quot;guest user&quot; however, it does not create a guest user in the instance.</td>
</tr>
</tbody>
</table>

*Email image filtering properties*

Use email image filtering properties to control how inbound email images are handled as attachments to and displayed in the activity formatter of target records.

By default, the system handles inbound email images, such as logos or email signatures, as attachments to inbound matched target records. These images are also visible in the activity formatter of the target records.
records. But with each email reply, the system replicates these images, which can cause duplicate image attachments to the target record and also duplicate images in the activity formatter.

To filter images from emails and reduce duplicate image attachments to target records, configure the following properties in the sys_properties.list table. Use these properties to:

- Specify the email image sizes eligible for filtering.
- Choose an action that controls image attachment behavior and image visibility in the activity formatter.

**Note:** These properties do not delete attachments. You can verify attachment records in the Attachments [sys_attachment.list] table.

### Table 113: Email image filtering properties

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Note: Regardless of the action you select, the image is visible when you choose to Preview HTML Email or Show Email Details in the activity formatter.</th>
</tr>
</thead>
</table>
| glide.email.inbound.image_sys_attachment.filter.minimum_bytes | Sets the minimum image size in bytes of inbound email images that can be filtered. Any image below this size limit is eligible for filtering.                                                         | Type: Integer  
- Default value: 0 (no filtering)  
- Location: sys_properties.list table                                                                 |
| glide.email.inbound.image_sys_attachment.filter.action    | Specifies the image filtering behavior.                                                                                                            | Type: Choice list  
- AttachTarget - Associate the image to the target record. The image is visible in the activity formatter and in the attachment to the target record.  
- AttachEmail - Attach the image to the email record. The image is not visible in the activity formatter of the target record nor in the attachment to the target record.  
- AttachNone - Do not attach the image to a record.                                                                 |
  
- Default value: AttachTarget  
- Location: sys_properties.list table                                                                 |

**Email digest properties**

Several properties are available to manage digest intervals for email digests.

The following properties are available for the email digest feature.

**Note:** To open the System Properties [sys_properties] table, enter sys_properties.list in the navigation filter.
### Table 114: Properties for email digest intervals

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.email.digest.default_interval</td>
<td>The sys_id of the default email digest interval available to users.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: 28d157e07f1332007f005212bdfa9116</td>
</tr>
<tr>
<td></td>
<td>• Location: System Property [sys_properties] table</td>
</tr>
<tr>
<td>glide.email.digest.max_intervals</td>
<td>The maximum number of email digest intervals that can be defined.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 100</td>
</tr>
<tr>
<td></td>
<td>• Location: System Property [sys_properties] table</td>
</tr>
<tr>
<td></td>
<td>• Learn more: For details on digest intervals, see <a href="#">Create or modify email digest intervals</a> on page 874.</td>
</tr>
</tbody>
</table>

### Additional email properties

There are several advanced email properties that you can use to fine tune the way your instance sends or receives email.

You must add these properties to the System Property [sys_properties] table before they can be used to overwrite the defaults.

### Table 115: Additional properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>com.glide.email.max_body_bytes</td>
<td>Sets the maximum body size in bytes allowed per inbound email.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 1048576</td>
</tr>
<tr>
<td>com.glide.email.max_read</td>
<td>Specifies the maximum number of emails a POP3 reader should process concurrently.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 20</td>
</tr>
<tr>
<td>com.snc.on_call_rotation.reminders.showtz</td>
<td>Specifies whether to show a user's timezone.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: false</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>glide.email.inbound.calendar_behavior</td>
<td>Specifies how the system stores calendar data, such as an invitation or an invitation response. Enter one of these options (not case sensitive):</td>
</tr>
<tr>
<td></td>
<td>• Attach: Store the calendar data as an attachment on the associated record, such as the incident or change that triggers an invitation.</td>
</tr>
<tr>
<td></td>
<td>• Ignore: Discard the calendar data.</td>
</tr>
<tr>
<td></td>
<td>• Inline: Store the calendar data as text in the email Body field.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: Attach</td>
</tr>
<tr>
<td>glide.email.inbound.convert_html_inline_attachment_references</td>
<td>Specifies whether to convert inbound email HTML so email images appear in the email HTML body preview. The system displays broken cid (content ID) links in place of images received when this property is disabled. The format in which the system displays an email image depends on the property setting at the time the email is received, not the current property setting.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td>glide.email.inbound.max_attachment_count</td>
<td>Sets the maximum number of attachments allowed per inbound email. This property is available starting with the Eureka Patch 4 release.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 30</td>
</tr>
<tr>
<td></td>
<td>• Location: System Property [sys_properties] table</td>
</tr>
<tr>
<td>glide.email.inbound.max_total_attachment_size_bytes</td>
<td>Sets the maximum total attachment size in bytes allowed per inbound email. This property is available starting with the Eureka Patch 4 release.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 18874368</td>
</tr>
<tr>
<td></td>
<td>• Location: System Property [sys_properties] table</td>
</tr>
<tr>
<td>glide.email.mail_to</td>
<td>Specifies the email address for sending notifications that use the ${mailto:} variable.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: value of glide.email.user property</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>glide.email.name_split</td>
<td>Specifies the delimiter used between first and last names in an email address. For example, a delimiter of &quot;.&quot; (period) in the email address <a href="mailto:john.smith@company.com">john.smith@company.com</a> tells the system to look for a user record for John Smith.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: period (.)</td>
</tr>
<tr>
<td>glide.email.notification.save_when_no_recipients</td>
<td>Controls whether a notification-generated sys_mail record is saved even if there are no recipients. Used in conjunction with other notification recipient logging properties, this property enables troubleshooting problems with notifications.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td>glide.email.outbound.header.auto_submitted</td>
<td>Stores the value used in the &quot;Auto-submitted&quot; outbound email header. Clear the property value to remove the &quot;Auto-submitted&quot; header from all outbound emails. Some spam filters flag auto-generated email as spam.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: auto-generated</td>
</tr>
<tr>
<td>glide.email.outbound.max_attachment_count</td>
<td>Sets the maximum number of attachments allowed per outbound email. This property is available starting with the Eureka Patch 4 release.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 30</td>
</tr>
<tr>
<td></td>
<td>• Location: System Property [sys_properties] table</td>
</tr>
<tr>
<td>glide.email.outbound.max_body_bytes</td>
<td>Sets the maximum body size in bytes allowed per outbound email.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 1048576</td>
</tr>
<tr>
<td>glide.email.outbound.max_total_attachment_size</td>
<td>Sets the maximum total attachment size in bytes allowed per outbound email. This property is available starting with the Eureka Patch 4 release.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 18874368</td>
</tr>
<tr>
<td></td>
<td>• Location: System Property [sys_properties] table</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>glide.email.override.url</td>
<td>Sets the URL to use in emailed links in place of the instance URL. The URL should end with nav_to.do. An example value is: <a href="https://servicenow.customerdomain.com/production/nav_to.do">https://servicenow.customerdomain.com/production/nav_to.do</a>. This property is suitable for customers who use custom redirect URLs for their instances.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: instance URL</td>
</tr>
<tr>
<td>glide.cms.use_email_override_url</td>
<td>Forces the system to use the glide.email.override.url property, rather than the glide.servlet.uri property, when a notification has a link to a CMS page in an instance.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: false</td>
</tr>
<tr>
<td></td>
<td>• Location: System Property [sys_properties] table</td>
</tr>
<tr>
<td>glide.email.smtp.max_recipients</td>
<td>Specifies the maximum number of recipients the instance can list in the To: line for a single email notification. Notifications that would exceed this limit instead create duplicate email notifications addressed to a subset of the recipient list. Each email notification has the same maximum number of recipients.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 100</td>
</tr>
<tr>
<td>glide.email.smtp.max_send</td>
<td>Specifies how many emails to send through each new SMTP connection. The instance establishes a new SMTP connection if there are more emails to send than the specified value.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 100</td>
</tr>
<tr>
<td>glide.email.text_plain.strip_xhtml</td>
<td>Indicates whether both outbound and inbound emails that are shown in comments convert the XML to plain text (true) or preserve the XML (false).</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td>glide.imap.secure</td>
<td>Specifies whether to enable SSL encryption for connections to the IMAP server.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: false</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>glide.imap.secure.port</td>
<td>Specifies the communications port for IMAP secure connections.</td>
</tr>
<tr>
<td></td>
<td>• Type: string                                                                ertas</td>
</tr>
<tr>
<td></td>
<td>• Default value: 995</td>
</tr>
<tr>
<td>glide.imap.tls</td>
<td>Specifies whether to start the IMAP server in Transport Layer Security (TLS) mode.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: false</td>
</tr>
<tr>
<td>glide.notification.recipient.exclude_logging</td>
<td>Master switch to enable or disable logging all reasons a recipient was excluded. If set to true, the subsequent properties dealing with the exclusion of logging are enabled. If it is set to false, none of the subsequent properties relating to the exclusion of logging are enabled. This property cannot suppress log messages generated by the glide.email.test.user property.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td>glide.notification.recipient.exclude_logging.device_inactive</td>
<td>Logs recipients who are excluded because their chosen notification device record is marked as inactive.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td>glide.notification.recipient.exclude_logging.device_schedule</td>
<td>Logs recipients who are excluded based on the Schedule field on the New Device for System Administrator form for their chosen notification device.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td>glide.notification.recipient.exclude_logging.event_creator</td>
<td>Logs recipients who are excluded because they initiated the notification event, such as updating an incident record, and the Send to Event Creator check box is cleared on the notification record.</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>glide.notification.recipient.exclude_logging.invalid_email</strong></td>
<td>Logs recipients who are excluded because the email address for that user is invalid, for example the @ is missing, or empty.* Type: true</td>
</tr>
<tr>
<td><strong>glide.notification.recipient.exclude_logging.user_calendar_integration_disabled</strong></td>
<td>Logs recipients of calendar invitations who are excluded because the Calendar Integration field is set to None on the user record.* Type: true</td>
</tr>
<tr>
<td><strong>glide.notification.recipient.exclude_logging.user_inactive</strong></td>
<td>Logs recipients who are excluded because the Active check box is cleared on the user record.* Type: true</td>
</tr>
<tr>
<td><strong>glide.notification.recipient.exclude_logging.user_notification_disabled</strong></td>
<td>Logs recipients who are excluded because the Notification field is set to Disabled on the user record.* Type: true</td>
</tr>
<tr>
<td><strong>glide.notification.recipient.include_logging</strong></td>
<td>Master switch to enable or disable logging all reasons a recipient was included. If set to true, the subsequent properties dealing with the inclusion of logging are enabled. If it is set to false, none of the subsequent properties relating to the inclusion of logging are enabled.* Type: true</td>
</tr>
<tr>
<td><strong>glide.notification.recipient.include_logging.delegate</strong></td>
<td>Logs recipients who are included because they are delegates of another user.* Type: true</td>
</tr>
<tr>
<td><strong>glide.notification.recipient.include_logging.event parm</strong></td>
<td>Logs recipients who are included because they are in the parm1 or parm2 fields of the event record.* Type: true</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| glide.notification.recipient.include_logging.recipient_fields | Logs recipients who are included via a notification target record, such as an incident record, specified in the Users/Groups in Field field for the notification record. The recipient_fields are fields in the target record that contain a recipient to add. For example, if the record that triggered the notification is an incident, and the assigned_to field for the incident is listed in recipient_fields, that user is included as a recipient.  
  - Type: true | false  
  - Default value: true |
| glide.notification.recipient.include_logging.recipient_groups.group_email | Logs recipients who are included in a group email for any group provided in the notification record’s recipient_groups or the event parm1 or parm2 field.  
  - Type: true | false  
  - Default value: true |
| glide.notification.recipient.include_logging.recipient_groups.manager | Logs recipients who are included because they manage any group provided in the notification record’s recipient_groups or the event parm1 or parm2 field.  
  - Type: true | false  
  - Default value: true |
| glide.notification.recipient.include_logging.recipient_groups.membership | Logs recipients who are included via membership in any group provided in the notification record recipient_groups or the event parm1 or parm2 field.  
  - Type: true | false  
  - Default value: true |
| glide.notification.recipient.include_logging.recipient_users | Logs recipients who are included via notification record’s Users field (recipient_users).  
  - Type: true | false  
  - Default value: true |
| glide.notification.recipient.include_logging.subscription | Logs recipients because they are subscribed via User Notification Preferences.  
  - Type: true | false  
  - Default value: true |
<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.pop3.parse_start</td>
<td>Specifies the text that indicates the beginning of the email body section. The instance parses name:value pairs within this section to set or update field values when processing inbound email actions.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: none</td>
</tr>
<tr>
<td>glide.pop3.parse_end</td>
<td>Text indicating the end of the email body section where the instance should parse name:value pairs to update field values when processing inbound email actions.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: none</td>
</tr>
<tr>
<td>glide.smtp.dateformat</td>
<td>Specify the date format to use for outgoing email notifications.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: date format listed in email sender's user record [sys_user.date_format]</td>
</tr>
<tr>
<td>glide.smtp.precedence_bulk</td>
<td>Specifies whether outbound email includes the header &quot;Precedence: bulk&quot;. Some spam filters flag bulk email as spam. Set the value to false to remove this header from outbound email.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td>glide.smtp.secure</td>
<td>Use the glide.smtp.encryption property in the Outgoing Mail Server section of the Mail Properties page to specify how to encrypt communications with the SMTP server.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: false</td>
</tr>
<tr>
<td>glide.smtp.timeformat</td>
<td>Specify the time format to use for outgoing email notifications.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: time format listed in email sender's user record [sys_user.time_format]</td>
</tr>
</tbody>
</table>
### Property | Description
--- | ---
| glide.smtp.tls | Use the glide.smtp.encryption property in the Outgoing Mail Server section of the Mail Properties page to specify how to encrypt communications with the SMTP server.  
  - Type: true | false  
  - Default value: false
| glide.ui.activity.email.use_display | Specifies whether to display email addresses or user IDs (display value from the User table) in email headers. If true, the instance searches for a user record with a matching email address. If it cannot find a matching user record, it displays the email address.  
  - Type: true | false  
  - Default value: false
| glide.ui.email_client.email_address.disambiguator | Sets the columns from the User [sys_user] table that the autocomplete list displays. Separate each column name with a semicolon character (;).  
  - Type: string  
  - Default value: name  
  - Learn more: Displaying Additional Information in the Email Client Autocomplete
| glide.ui.incident_activity.max_addresses | Specifies the maximum number of addresses to list in an email audit record. If the number of addresses exceeds this limit, the instance truncates the list after the maximum value and displays an ellipsis character (...).  
  - Type: string  
  - Default value: 5
| NotifyAffectedCI.max_rel_level | Sets a value used by the Affected ci notifications business rule, which notifies subscribers when configuration items (CIs) are affected by tasks. The business rule generates notifications for parent CIs up to the level defined by this property. You might need to adjust the property value according to the complexity and depth of your CI relationships.  
  - Type: integer  
  - Default value: 5

### Deprecated mail server properties
In previous releases, you could configure email accounts from the Email Properties page.
Starting with the Geneva release, you must configure email accounts from the System Mailboxes Email Accounts module. Properties related to email accounts are deprecated. The same functionality in these deprecated properties is configured on the Email Account form.

Properties deprecated in the Geneva release

- SMTP mail server (glide.email.server)
- SMTP account (glide.email.user)
- Outgoing mail display name (glide.email.username)
- SMTP account password (glide.email.user_password)
- POP3 mail server (glide.pop3.server)
- POP3 account (glide.pop3.user)
- POP3 account password (glide.pop3.password)
- POP3 server port (110) (glide.pop3.port)
- Connect to POP3 server using SSL encryption (glide.pop3.secure)
- SMTP server requires username and password authentication (glide.smtp.auth)
- SMTP server port (25) (glide.smtp.port)
- SMTP Encryption (glide.smtp_encryption)
- [Legacy] TLS security for SMTP (glide.smtp.tls)

Email logs

The email log records all email notifications sent from the instance. This is a verbose and unfiltered view of email. For a more detailed view, see the System Mailbox application.

This log provides the following information for all notifications.

Table 116: Email log

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mailbox</td>
<td>The system mailbox to use for filtering the email notifications displayed.</td>
</tr>
<tr>
<td>State</td>
<td>The current state of the notification (Error, Ignored, Processed, or Ready).</td>
</tr>
<tr>
<td>Receive type</td>
<td>The type of inbound email notification (None, Forward, New, or Reply).</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Type</td>
<td>The status of the email notification. Choices are:</td>
</tr>
<tr>
<td></td>
<td>• received: The server received this email.</td>
</tr>
<tr>
<td></td>
<td>• received - ignored: The server received this email, but it was ignored by the instance for inbound email action purposes. Typically, these emails are either spam or auto-replies. See the Error String field for details.</td>
</tr>
<tr>
<td></td>
<td>• send - failed: The server has attempted to send the email and failed. See the Error String field for details.</td>
</tr>
<tr>
<td></td>
<td>• send - ignored: The server skipped sending this email. Typically, this is for an email which was generated but lacked a recipient email address or is a duplicate email. See the Error String field for details.</td>
</tr>
<tr>
<td></td>
<td>• send - ready: The email is ready to be sent, but has not been sent out by the mail server. Typically, an email remains in this state for only a short time.</td>
</tr>
<tr>
<td></td>
<td>• sent: The email was sent by the instance without any errors or issues.</td>
</tr>
<tr>
<td>Target</td>
<td>A Document ID reference to the record if the email is generated by an insert, update, or delete of a particular record.</td>
</tr>
<tr>
<td>User</td>
<td>The name of the user, from the user record, of the instance from which the email notification was sent.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This is a string field.</td>
</tr>
<tr>
<td>Notification Type</td>
<td>The type of notification. Choices are:</td>
</tr>
<tr>
<td></td>
<td>• None</td>
</tr>
<tr>
<td></td>
<td>• SMS</td>
</tr>
<tr>
<td></td>
<td>• SMTP</td>
</tr>
<tr>
<td>UID</td>
<td>The unique ID for the server.</td>
</tr>
<tr>
<td>Created</td>
<td>The date and time of the email activity for the locale of the machine running the instance.</td>
</tr>
<tr>
<td>Deleted</td>
<td>An indication of whether the email was deleted from an instance mailbox.</td>
</tr>
<tr>
<td>Weight</td>
<td>The weight of the email, which determines the sending priority relative to other notifications on the same table.</td>
</tr>
<tr>
<td>Importance</td>
<td>An indication that the email was sent with a changed level of importance, such as Urgent.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Originating Event and Notification</td>
<td>An embedded list that stores the event and notification that initiated the email notification.</td>
</tr>
<tr>
<td>Subject</td>
<td>A configured description of the action that generated the email notification. You create the subject text for notifications in System Notification Email Notifications.</td>
</tr>
<tr>
<td>Error String</td>
<td>The error string captured from the email server to determine why the email was not sent. This is logged only if the email is send-failed.</td>
</tr>
<tr>
<td>Recipients</td>
<td>The email address of the recipient of each notification.</td>
</tr>
<tr>
<td>Body</td>
<td>The body of the email, displayed in raw HTML markup. Use the related link Preview HTML Body to see the body text as rendered HTML.</td>
</tr>
<tr>
<td>Content type</td>
<td>The email content type.</td>
</tr>
<tr>
<td>Headers</td>
<td>Any headers embedded in the email.</td>
</tr>
</tbody>
</table>

Invalid email addresses that the instance strips out of outbound email messages are logged, starting with the Geneva release.

**Outbound email notification recipients**

For outbound notifications, the email system log provides reasons that recipients were included or excluded.

Each log entry corresponds to a reason for inclusion or exclusion. For example, all users who were excluded because they are inactive appear in a single log entry.

A series of system properties can be used to fine-tune the information to be logged. Two master switch properties, glide.notification.recipient.include_logging and glide.notification.recipient.exclude_logging, control all recipient inclusion and exclusion logging. Several other properties allow you to tailor the information reported in the logs to meet your needs. All of the properties are enabled by default.
Email size limits
To prevent issues with large email messages, the system enforces configured limits on the maximum allowed email body size, total attachment file size, and number of attachments per email. Administrators can modify the maximum values using properties.

Note: The system cannot send or receive emails that exceed the maximum email size, even if one or more properties are configured to allow bigger attachments.

Message body size limit properties
Several properties enforce the maximum email body size allowed for inbound and outbound email messages.

Properties
In some situations, an email message may contain more information in the body than the system can process, especially when string searches and regular expressions are used. By default, the system can process only up to 16MB worth of information in the email body and body_text fields (8MB each). If the email body exceeds this limit, the system truncates the body text.

Users with the admin role can configure the following properties to control email body size limits. The properties can be added to the System Property [sys_properties] table. Neither property should exceed the system limit of 16MB. Setting either of the following properties to an excessively large value may cause performance issues.
Table 117: Message body size limit properties

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>com.glide.email.max_body_bytes</td>
<td>Sets the maximum body size in bytes allowed per inbound email. Ensure that the sum of this property and the glide.email.inbound.max_total_attachment_size_bytes property is well below the maximum total email size.</td>
<td>integer</td>
<td>1048576</td>
</tr>
<tr>
<td>glide.email.outbound.max_body_bytes</td>
<td>Sets the maximum body size in bytes allowed per outbound email. Ensure that the sum of this property and the glide.email.outbound.max_total_attachment_size_bytes property is well below the maximum total email size.</td>
<td>integer</td>
<td>1048576</td>
</tr>
</tbody>
</table>

**Note:** A different property, com.glide.attachment.max_size, sets the maximum file size allowed for any attachment in the system and overrides any larger values of glide.email.inbound.max_total_attachment_size_bytes and glide.email.outbound.max_total_attachment_size_bytes.

Inbound email body processing

For inbound emails, the system enforces the maximum body size as set by the com.glide.email.max_body_bytes property. When the body size exceeds the configured value:

- The system does not run inbound email actions that would otherwise be triggered by the email.
- The system truncates the Body text on the Email form.
- The system logs a warning and sets the Error string field on the Email form. The log message for such an email might look like this:

```
Email set to receive-ignored because its size exceeds the value set in com.glide.email.max_body_bytes. 1995 character(s) were truncated from the body field.
```

Outbound email body processing

For outbound emails, the system enforces the maximum body size as set by the glide.email.outbound.max_body_bytes property. When the body size exceeds the configured value:

- The system does not send the email.
- The system truncates the Body text on the Email form.
- The system logs a warning and sets the Error string field on the Email form. The log message for such an email might look like this:
Email set to send-ignored because its size exceeds the value set in glide.email.outbound.max_body_bytes. 1337 character(s) were truncated from the body field.

Attachment limit properties
Several properties control email attachment limits.

Properties

All the properties are located in the System Property [sys_properties] table. Setting any of the following properties to an excessively large value may cause performance issues.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.email.inbound.max_attachment_count</td>
<td>Sets the maximum number of attachments allowed per inbound email.</td>
</tr>
<tr>
<td>• Type: integer</td>
<td>• Default value: 30</td>
</tr>
<tr>
<td>• Learn more: Inbound Email Attachment Processing</td>
<td></td>
</tr>
<tr>
<td>glide.email.inbound.max_total_attachment_size_bytes</td>
<td>Sets the maximum total attachment size in bytes allowed per inbound email.</td>
</tr>
<tr>
<td>• Type: integer</td>
<td>• Default value: 18874368</td>
</tr>
<tr>
<td>• Learn more: Inbound Email Attachment Processing</td>
<td></td>
</tr>
<tr>
<td>glide.email.outbound.max_attachment_count</td>
<td>Sets the maximum number of attachments allowed per outbound email.</td>
</tr>
<tr>
<td>• Type: integer</td>
<td>• Default value: 30</td>
</tr>
<tr>
<td>• Learn more: Outbound Email Attachment Processing</td>
<td></td>
</tr>
<tr>
<td>glide.email.outbound.max_total_attachment_size_bytes</td>
<td>Sets the maximum total attachment size in bytes allowed per outbound email. To send an email, the system must encode the contents of the email. This process may significantly increase the size of the email, including any attachments. It is best to set this property to a value well below the maximum email size.</td>
</tr>
<tr>
<td>• Type: integer</td>
<td>• Default value: 18874368</td>
</tr>
<tr>
<td>• Learn more: Outbound Email Attachment Processing</td>
<td></td>
</tr>
</tbody>
</table>
Note: A different property, com.glide.attachment.max_size, sets the maximum file size allowed for any attachment in the system and overrides any larger values of glide.email.inbound.max_total_attachment_size_bytes and glide.email.outbound.max_total_attachment_size_bytes.

Inbound email attachment processing

For inbound emails, the system enforces the maximum number and size of attachments as set by the glide.email.inbound.max_attachment_count and glide.email.inbound.max_total_attachment_size_bytes properties. When the attachments for an inbound email exceed either value, the system logs a warning and discards the excess attachments. The order in which the system processes the attachments determines which attachments are discarded. This order may not be consistent from email to email.

Outbound email attachment processing

For outbound emails, the system enforces the maximum number and size of attachments as set by the glide.email.outbound.max_attachment_count and glide.email.outbound.max_total_attachment_size_bytes properties. Email records are created from various sources and may exceed the configured attachment limits.

Emails that are ready to be sent from the Email [sys_email] table are subject to the outbound attachment limits. Emails that exceed either limit trigger a warning in the email system log and are sent with attachments up to the maximum number or total file size.

The log message for such an email might look like this:

Maximum combined attachment size exceeded. (max:15728640 bytes). One or more attachment records ignored.

Emails for notifications, scheduled reports, and exported tables

Notifications can be set to include all the attachments from the record that triggers the notification. If the attachments exceed either of the outbound email attachment limits, the system excludes the excess attachments from the email and logs a warning message.

Reports can be scheduled for email distribution as attachments. Large reports may exceed the outbound attachment size limit. In this case, the system sends the scheduled report email without the report attached and logs a warning message. To avoid the issue, send links to large reports instead of sending the reports as attachments.

If a user attempts to export numerous records from a list that exceeds a configured warning threshold, a dialog box offers the option to email the exported records as an attachment. If the attachment exceeds the outbound attachment size limit, the system sends the email without the exported record list attached and logs a warning message.

Domain separation and Notifications

This is an overview of domain separation and the Notifications application. Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.
Overview

Support: Level 2

Domain separation is supported in this application. Not all ServiceNow applications support domain separation; some include limitations on the data and administrative settings that can be domain separated. To learn more, see Application support for domain separation.

Domain separation is specifically supported in Notifications but not in email accounts. Notifications are not data-separated but they are process-separated. Notifications are also triggered by specific actions.

How domain separation works in Notifications

There are two basic components of domain separation and Notifications.

- Notifications are process-separated (not data-separated).
- Notifications are triggered in two main ways:
  1. When a record is Inserted or Updated
     a. Notifications with matching conditions AND in the same domain as the inserted/updated record are processed.
  2. When an event defined in the notification is triggered
     a. Events typically have a target record. For example, [incident.inserted] event references the incident record being inserted.
     b. When an event is fired, notifications configured for that event in the same domain as the event’s target record are processed.

Domains and email accounts

Domain separation is not supported in email accounts for these reasons:

1. Sending mail: There is only one SMTP sender per account. This prohibits providing domains for each account, and they are not configurable.
2. For receiving Inbound mail: You can set up multiple email accounts but cannot meaningfully set the domain of an inbound email action. Inbound Actions are processed in the domain of the user who sent the email. For example: User_A in Domain A sends an email to a ServiceNow email account which executes the “Create an incident” inbound email action. The resulting new incident created by the inbound action is in Domain A.

To learn more see Inbound email actions on page 732.

Note: If the number of email accounts exceeds 20, reception of email slows down.

Use case

- If an instance is using the Domain separation plugin and a new email notification is defined for a domain that has the same event as the notification on the global domain, the user receives two emails for the same event.
Solution: Set the [sys_overrides] field on the notification that belongs to the domain so it overrides the setting on global. For more information, see *Delegated administration*.

**Next steps after enabling email**

After enabling email on your instance, consider performing several of these important tasks.

- Test the email configuration by routing all email to a single user (set the glide.email.test.user property).
- Review the baseline notification categories, email notifications, and templates to determine if they meet your business needs.
- Review the baseline inbound email actions to determine if they meet your business needs.
- Determine if you want to use email layouts to add consistent content elements.
- Determine if you want to use email filters to restrict the email the instance receives.
- Determine if you want to implement a retention policy to archive and destroy email at certain intervals.
- Determine what kind of watermarks outbound email uses to associate records with email messages.
- Determine if you want to create users when the instance receives an email from an unrecognized user.
- Set the precedence of outgoing mail. By default, the instance sends email with a precedence of bulk (set the glide.smtp.precedence_bulk property).
- Consider preventing untrusted users from triggering inbound actions to prevent unwanted email from affecting your instance.
- Implement a spam filter to restrict unwanted messages sent to your custom email addresses.

**Create notification categories**

You can create notification categories to identify and group related notifications that are listed in the notification settings for your users.

Role required: admin

Before adding new categories, review the base system notification categories in the Notification Categories [sys_notification_category] table to determine if you need a new category.

1. Navigate to System Notification Email Notification Categories .
2. Click New.
3. Enter the Name of the category to identify the family of notifications. Provide a category name that is meaningful to your users, so that they can easily find their notifications under the appropriate category in their notification settings.
4. Enter a Short description to identify the category.
5. Click Submit.

The system adds the new category to the Notification Categories [sys_notification_category] table. After you create at least one, active notification that uses the new category, the category and notification are listed in the notification settings for users (Notifications tab in the System Settings window).

**Create an email notification**

Creating an email notification involves specifying when to send it, who receives it, what it contains, and if it can be delivered in an email digest.

Role required: admin

Consider the following items when you create or update a notification:

- Your notification recipients must be active users and have a valid email address defined.
ServiceNow users or members of groups must be defined as active users in the User [sys_user] table. They must also have a valid email address defined for their primary channel (device) in the Notification Device [cmn_notif_device] table. If users do not have an active profile and a valid email address, they will not receive notifications.

- Your notification recipients must have the appropriate notification preferences enabled.

If the notification is subscribable, each ServiceNow user or group member must have the notification and channels (devices) for the notification enabled in their notification preferences. Admins can impersonate users to review and configure their notification preferences.

- After you create or update the notification, use the Preview Notification option to examine it. For example, you can test links that you may have added and verify the notification recipients. For details, see Preview email notifications on page 672.

Use the following tabs in the Notification form to configure an email notification:

- When to send — Conditions required to send the notification.
- Who will receive — Recipients of the notification.
- What it will contain — Contents of the notification.
- What Digest will contain — Contents of the email digest if the notification can be delivered in a digest.

**Note:** If you do not see all the fields on the form, switch to the Advanced view.

The following video shows how to configure inbound email actions and how to create and edit a notification. In the video, go to 3:35 for details on configuring a notification.

1. Navigate to System Notification Email Notifications.
2. Click New.
3. Fill in the fields at the top of the Notification form, as appropriate.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a unique name for the email notification. Descriptive names help identify the purpose of the email notification. For example, Incident Opened &amp; Unassigned.</td>
</tr>
<tr>
<td>Table</td>
<td>Select the database table to link the notification to, for example Incident [incident].</td>
</tr>
<tr>
<td>Category</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td></td>
</tr>
</tbody>
</table>

**Attention:** Do not select the Task [task] table. This table is for extending other tables. Notifications that run on the Task table directly are not supported.

**Note:** Only tables and database views that are in the same application scope appear in the list.

<p>| Type   | Select the type of notification you are creating: EMAIL or Meeting Invitation. |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>Select the check box to enable the email notification.</td>
</tr>
<tr>
<td>Category</td>
<td>Select the category to which this notification belongs. A category identifies and groups related notifications. This notification, if active and subscribable, is listed in the selected Category in the notification preferences for each user (Notifications tab in the System Settings window).</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Do not leave the category as Uncategorized, as users may not be able to find the notification in their list of notifications. If you need a new category, see Create notification categories.</td>
</tr>
<tr>
<td>Allow Digest</td>
<td>Select the check box if an email digest is to be created for the notification. If selected, the What Digest will contain tab is displayed for creating the digest content.</td>
</tr>
<tr>
<td>Description</td>
<td>Type a description for this notification.</td>
</tr>
</tbody>
</table>

4. Fill in the fields on the When to send tab.
**Note:** If the same trigger generates multiple notifications, the system only sends one notification. The system considers all other notifications, even if they have a different subject and body, as duplicates. The Ignore Duplicates business rule controls this functionality.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Send when</td>
<td>Select under what condition the notification is sent:</td>
</tr>
<tr>
<td></td>
<td>• When a record is inserted or updated</td>
</tr>
<tr>
<td></td>
<td>• When a particular event is fired</td>
</tr>
<tr>
<td></td>
<td>• When <em>triggered as an action step</em> in Flow Designer</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Weight</td>
<td>[Required] Set a numerical value for the notification priority relative to other notifications with the same target table and recipients. The system only sends the notification with the highest weight. All other notifications are moved from the Outbox to the Skipped mailbox. The default value 0 causes the system to always send the notification (assuming the conditions are met). For example, suppose that a service desk agent adds a comment to an incident and shortly thereafter closes it. By default, these actions trigger both the Incident commented and Incident Closed notifications. However, both notifications are from the Incident table and also notify the incident caller. The system only sends the notification with the highest weight, which in this case is the Incident Closed notification. <strong>Note:</strong> The SMTP Sender scheduled job determines how often to send email. By default, this job runs every minute.</td>
</tr>
<tr>
<td>Conditions</td>
<td>Use the condition builder to select the conditions under which this notification is sent. For example, select Priority &gt; greater than &gt; 3 - Moderate to send the notification only for High and Critical priority incidents.</td>
</tr>
<tr>
<td>Inserted</td>
<td>Select the check box to enable email notification when a record is inserted. This field appears when you set the Send when field to Record inserted or updated.</td>
</tr>
<tr>
<td>Updated</td>
<td>Select the check box to enable email notification when a record is updated. This field appears when you set the Send when field to Record inserted or updated.</td>
</tr>
<tr>
<td>Event name</td>
<td>Select the event that triggers this notification. This field appears when you set the Send when field to Event is fired.</td>
</tr>
</tbody>
</table>
### Advanced Condition

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced condition</td>
<td>Create a script to perform certain actions, like sending a notification based on the current email record, changing field values, or changing system properties.</td>
</tr>
<tr>
<td></td>
<td>The <strong>advanced condition</strong> script must return true or set a global answer variable to true to send the notification.</td>
</tr>
<tr>
<td></td>
<td>The advanced condition script uses the following global variables:</td>
</tr>
<tr>
<td></td>
<td>• current: contains the current record from the table to which the notification is linked.</td>
</tr>
<tr>
<td></td>
<td>• event: contains the event that triggered the notification.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> The Advanced condition field is evaluated in addition to other conditions you set on the notification. Both the condition and advanced condition must evaluate to true to send the notification.</td>
</tr>
</tbody>
</table>

5. Fill in the fields on the Who will receive tab.

The following example shows the default view of the tab. The advanced view contains additional fields (see table).

**Tip:** Consider limiting the recipient list of any notification to 1000 users. By default, if a notification has more than 100 intended recipients, the system creates multiple notification messages with up to 100 recipients each. If you want to change the recipient limit, set the system property glide.email.smtp.max_recipients.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Users</td>
<td>Select the users you want to receive the email notification. You can search for users with the reference lookup icon or manually add their email addresses. This list of users is static.</td>
</tr>
</tbody>
</table>
| Users/groups in fields| Select users or groups from reference fields. For example, if a notification uses the Incident [incident] table, you can select users or groups from incident fields like Opened by and Assignment group. This list of users or groups is variable and depends upon the values of the associated task record.  

**Note:** You can dot-walk to values in reference fields by clicking the plus sign in the field selector and then selecting the related field.  

If you address the notification to a user with an inactive record in the User [sys_user] table, the system does not send the notification to that user. |
| Groups                | Select the groups you want to receive the email notification. You can search for groups with the reference lookup icon or by manually entering the group name. This list of groups is static. |
| Exclude delegates     | Select this option to prevent the instance from sending email notifications to delegates of the users and members of the groups you selected. |
| Send to event creator | Select this check box to send the notification to the person who performed the action that started the notification process if the person is also a recipient. If the event creator is not specified in one of the recipient fields, the event creator does not receive a notification regardless of the setting in this field.  

For new notifications, this option is selected by default.  

If you want to know why you may not be receiving certain email notifications, see the blog post *Troubleshooting email notifications - Send to the Event Creator* by a ServiceNow Technical Support Engineer in the ServiceNow Community. |
### Field Description

**Event parm 1 contains recipient**
Select this check box if the event parameter 1 contains one or more notification recipients (in a comma separated-list). This field is visible only when the Send when field is set to Event is fired.

**Event parm 2 contains recipient**
Select this check box if the event parameter 2 contains one or more notification recipients (in a comma-separated list). This field is visible only when the Send when field is set to Event is fired.

**Subscribable**
Select this check box to allow all users to subscribe to this notification. See *Subscription-based notifications* on page 822 for more information.

---

**Note:** If the record contains sensitive or protected data, consider restricting the recipient list only to those users and groups who normally have access to it, and do not enable the Subscribable option. You can also configure your notification content so that private or sensitive data is not exposed. For example, you could insert a link back to the associated record, so that details are not revealed in the notification.

---

**Note:** The system does not exclude recipients based on access controls. Recipients can receive email about records that they cannot normally access from the user interface. For example, requesters can receive email about incidents and catalog requests opened on their behalf even though they normally do not have access to these records. If a notification includes record details, verify that all recipients need these details.

6. Fill in the fields on the What it will contain tab.
   The following example shows the default view of the tab. The advanced view contains additional fields (see table).
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email template</td>
<td>If you want to reuse existing content, select an email template to add content to the email notification.</td>
</tr>
<tr>
<td>Subject</td>
<td>Enter the subject line for the email message. The subject can include variables from the Select variables column. If empty, the system uses the Subject value from the Email template. If you enter a value in this field, it overrides the template value.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Message HTML</td>
<td>Enter the content of the email notification message. The message can include variables from the Select variables column. Variables map to column names available from the notification table, its parent tables, and reference tables. Use variables to include values from a record in the table such as an incident short description or comments and work notes. The Message HTML field is visible only if you set the content type to HTML and plain text or HTML only. If empty, the system uses the Message HTML value from the Email template. If you enter a value in this field, it overrides the template value. To prevent adding extra <code>&lt;p&gt;</code> and <code>&lt;div&gt;</code> elements to your email notifications, see the blog post <a href="https://service-now.com/blog">Extra line spacing with paragraph tags in email client</a> by a ServiceNow employee in the ServiceNow Community.</td>
</tr>
<tr>
<td>SMS alternate</td>
<td>Enter the notification message to send to an SMS device. The SMS alternate message is limited to 140 characters. If empty, the system uses the SMS alternate value from the Email template. If you enter a value in this field, it overrides the template value.</td>
</tr>
<tr>
<td>Importance</td>
<td>Set the importance of the email message to low or high.</td>
</tr>
<tr>
<td>Content type</td>
<td>Select the content type for the email notification:</td>
</tr>
<tr>
<td></td>
<td>• HTML and plain text</td>
</tr>
<tr>
<td></td>
<td>• HTML only</td>
</tr>
<tr>
<td></td>
<td>• Plain text only</td>
</tr>
<tr>
<td></td>
<td>By default, HTML only is enabled.</td>
</tr>
<tr>
<td>Include attachments</td>
<td>Select this check box to send all attachments from the triggering record as email attachments.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Omit watermark</td>
<td>Use this check box to apply or remove the watermark attached to each email. If the email does not contain a watermark, the system reviews the conditions of the inbound actions to create or update task records. For more information, and an alternative way to hide watermarks, see Watermarks on notification emails on page 769.</td>
</tr>
</tbody>
</table>
| Message Text        | Enter the notification message to send in plain text. This field appears when you set the content type to HTML and plain text or Plain text only.  
If empty, the system uses the Message Text value from the Email template. If you enter a value in this field, it overrides the template value. |
| From                | Enter the email address that you want the email notification to use in the From field. For example, helpdesk@yourcompany.com. The email must be in a valid format, otherwise a notification message appears near the field.  
Changing this address may require an advanced email setup such as enabling email forwarding, for example when using Sender Policy Framework (SPF) records for spam detection. |
| Reply to            | Enter the email address you want people to use when replying to the email notification. For example, helpdesk@yourcompany.com. The email must be in a valid format, otherwise a notification message appears near the field.  
Changing this address requires an advanced email setup such as enabling email forwarding, |
<p>| Push message only   | Select this option to send this notification only as a push notification to a mobile device. The Push Notification feature must be active. |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
</table>
| Push messages | Associate one or more push messages with this notification. The *Push Notification* feature must be active.  
*Note:* The push message and notification must be for the same table. |

7. If you selected the Allow Digest check box, fill in the fields on the What Digest will contain tab to create the email digest content for the notification. The following example shows the default view of the tab. The advanced view contains additional fields (see table).
If you want to reuse existing content, such as headers or footers, select an email template to add content to the email digest.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digest Subject</td>
<td>Enter the subject line for the email digest. The subject can include variables from the Select variables column. If empty, the system uses the Subject value from the Email template. If you enter a value in this field, it overrides the template value.</td>
</tr>
<tr>
<td>Digest HTML</td>
<td>Enter the recurring content for the email digest. The digest content can include variables from the Select variables column. Variables map to column names available from the notification table, its parent tables, and reference tables. Use variables to include values from a record in the table such as an incident short description or comments and work notes. To prevent adding extra <code>&lt;p&gt;</code> and <code>&lt;div&gt;</code> elements to your email digest, see the blog post <em>Extra line spacing with paragraph tags in email client</em> by a ServiceNow employee in the ServiceNow Community.</td>
</tr>
<tr>
<td>Digest Separator (HTML)</td>
<td>Use the line to separate each item summarized in the digest.</td>
</tr>
<tr>
<td>Digest From</td>
<td>Enter the email address to be used in the From field of the email digest. For example, <a href="mailto:helpdesk@yourcompany.com">helpdesk@yourcompany.com</a>. The email address must be in a valid format, otherwise a notification message appears near the field. Changing this address requires an advanced email setup such as enabling email forwarding.</td>
</tr>
<tr>
<td>Digest Reply To</td>
<td>Enter the email address that you want people to use when replying to the email digest. For example, <a href="mailto:helpdesk@yourcompany.com">helpdesk@yourcompany.com</a>. The email must be in a valid format, otherwise a notification message appears near the field. Changing this address requires an advanced email setup such as enabling email forwarding.</td>
</tr>
<tr>
<td>Digest Text</td>
<td>Enter the recurring content of the email digest to send in plain text. This field appears when you set the content type to HTML and plain text or Plain text only.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Digest Separator (text)</td>
<td>[Optional] Use the dash character as a line to separate each item summarized in the digest. This field appears when you set the content type to HTML and plain text or Plain text only.</td>
</tr>
</tbody>
</table>

When you save or update the notification, the *email Digest option is available for the notification* in the notification settings of your users.

8. When you finish creating the notification, click Submit. Or, if you are done modifying the notification, click Update.

Use the Preview Notification option to *check your notification*. For example, you can see:

- How the Subject and Message fields are displayed.
- Which users will or will not receive the notification, including the reasons why users will not receive it.

*Convert legacy email notifications to rich HTML*

By default, new email notifications are created in the rich HTML format. But you can also convert legacy notifications to rich HTML.

Role required: admin

1. Navigate to *System Notification Email Notifications*.
2. On the Email Notifications list screen, click the name of the email notification you want to convert.
3. Click the *What it will contain* tab.
Notification - Notify test case user [Advanced view]

When to send  Who will receive  What it will contain

If using an Email Template then Subject and Message will be used from the template unless overridden with a Subject and Message on this form.

Content type: HTML and plain text

Include attachments

Omit watermark

Push Message Only

Email template

Subject: Test notification: New test assigned to you on $(metric_type) - due by $(due_date)

Message:

You have been assigned to complete tests on $(metric_type). Please follow the link below and complete the tests by $(due_date). You can save your results until you are ready to submit them. When you have completed the test, and filled in all final results, submit the test.

Click here to begin the test:
<mail_script>
var title = new AssessmentTitle().getAssessmentTitleURL($(current.sys_id);
var url = "a href=" + link + "">link</a>;
template.print(url);
</mail_script>

To view your test queue at any time, sign in and navigate to Self-Service > My Tests.

SMS alternate

Select variables:

Select variables:
4. Click Switch to Rich HTML Editor.

The system copies any raw HTML from the Message field and converts it to rich HTML in the Message HTML field. Additionally, any mail scripts in the body are automatically saved to the Email Script [sys_script_email] table and are replaced in the notification body with an embedded script tag. This makes the notification body easier to read.
If using an Email Template then Subject and Message will be used from the template unless overridden with a Subject and Message on this form.

Content type: HTML and plain text
Importance: -- None --

Include attachments

Omit watermark

Push Message Only

Push Messages: Notify test case user

Email template

Subject: Test notification: New test assigned to you [metric_type] - due by [due_date]

Message HTML:

You have been assigned to complete tests on [metric_type]. Please follow the link below and complete the test by [due_date]. You can save your results until you are ready to submit them. When you have completed the test, and filled in all final results, submit the test.

Click here to begin the test:
[mail_script: Notify bad case user_script.1]

To view your test queue at any time, sign in and navigate to Self-Service > My Tests.
When you convert an email notification that was created in a version prior to Eureka to rich HTML, mail scripts are automatically moved to the Email Script [sys_script_email] table and an embedded script tag with the name of the script is automatically inserted into the body of the notification.

When creating new email notifications, write mail scripts using System Notification Email Notification Email Scripts. When the scripts are completed, add a ${mail_script:script name} embedded script tag to the email notification body. This makes it easy to use the same scripts in multiple email notifications. All you need to copy and paste from one notification to the next is the embedded script tag.

If you manually enter a mail script, any text bounded by <mail_script> </mail_script> in the body of a new or converted email notification or template which is saved to the record, a message asks whether the mail script should be converted.

In many cases, an unconverted mail script fails to run from inside the HTML editor. If you select Yes, the script is added to the Email Script [sys_script_email] table and is automatically replaced in the body with an embedded script tag. You can view the mail scripts in their original form by opening the email notification and clicking the Show Notification Scripts related link.

Control visibility to email records generated by notifications
Define conditions that restrict read access to target email records containing sensitive information.

Role required: admin

Use the Email Access Restriction [email_access_restriction] table to define conditions that control read access to an email record generated by a notification containing sensitive information. These conditions are processed by the base system ACL for the Email [sys_email] table.

When you specify conditions to restrict access for a notification, the email records are visible only to users that match the conditions specified for the notification.

1. Navigate to System Notification Email Access Restriction.
2. Click New.
3. Complete the form.
Table 119:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notification</td>
<td>Choose the notification that generates the email record that should be restricted.</td>
</tr>
<tr>
<td>Application</td>
<td>Displays the application scope.</td>
</tr>
<tr>
<td>Table</td>
<td>Displays the target table for the notification that you selected.</td>
</tr>
<tr>
<td>Condition</td>
<td>Use the condition builder to determine who can access the email record. The conditions must evaluate to true to enable read access to the email record.</td>
</tr>
<tr>
<td>Description</td>
<td>Enter a short description of the read access restriction.</td>
</tr>
</tbody>
</table>

4. Click Submit.

Advanced conditions for email notifications
Use an advanced condition to send a notification based on the current email record, changing field values, or system properties.

The advanced condition script must set the answer variable to true to send the notification. For example, to prevent the system from sending an email notification if the sender of a self-service request is a member of the XYZ group, use this code:

```javascript
var groupMember = gs.getUser();
if(groupMember.isMemberOf('XYZ')){
    answer = false;
} else{
    answer = true;
}
```

You can add a script-based condition in the Advanced condition field by configuring the Email Notification form and adding the field. You can access the field in the Advanced view without configuring the form.

The advanced condition script uses the following business rule global variables:
- current: contains the current record from the table to which the notification is linked.
- event: contains the event that triggered the notification.

Note: The Advanced condition field is evaluated in addition to other conditions you set on the notification. Both the Condition and Advanced condition must evaluate to true in order to send the notification.

Edit HTML content in an email notification
For added control over the content of a converted email notification, you can edit the underlying HTML.

Role required: admin

1. With the converted email notification displayed in the Message text field, click the HTML button in the rich HTML editor.
2. Make the needed changes to the HTML.
3. Click Update.

Document attachments on an email notification
You can attach documents and reports to email notifications by scripting or linking to the sys ID of the record.

You can include all attachments from the source record with the notification. For example, if an incident update generates a notification, you can include all attachments from the incident record with the notification. To include all attachments from the source record, select the check box for the Include attachments field. Note that email messages, including attachments, cannot exceed the maximum email size. This size includes MIME encoding. For details on MIME encoding, see Email service size restrictions on page 597.

Attaching documents with scripting

Using scripting, you can attach documents by linking to them, or you can attach various types of reports by specifying their IDs in the system.
Linking to an attachment

You can add attachments to a notification by linking to the attachment record in the message of the notification. Linking to attachment records in this fashion requires using email notification scripting. For example:

```javascript
template.print ( 'Attachment: <a href="/sys_attachment.do?sys_id=' + gr.sys_id + '">' + gr.file_name + '</a>
 ' ) ;
```

Attaching reports using the Sys ID

You can also attach various types of reports, including gauges, dashboards, and charts, to a notification. The scripts to attach these reports take the following syntax:

```javascript
${report:X:Y}
```

where:

X is the type of report you want to attach (reportID, gaugeID, dashboardID, or chartID).

Y is the sys ID of the report, gauge, dashboard, or chart to be attached.

For example:

- `${report:reportID:<abc123>}
- `${report:gaugeID:<abc123>}
- `${report:dashboardID:<abc123>}
- `${report:chartID:<abc123>}

Line breaks in email notifications and rich HTML

Rich HTML provides additional control over line breaks in your email notifications and templates.

To provide control over line breaks, a Newlines to HTML check box is available in the Email Script form.

Figure 157: Newlines to HTML option
Selecting the Newlines to HTML check box indicates that the method for handling line breaks in earlier versions carries forward for email notifications and templates. When an email notification or template is converted to rich HTML, the Newlines to HTML check box is automatically selected.

For new mail scripts, add correct HTML line breaks to template.print() statements.

If an email notification or template is not converted to rich HTML, newlines are automatically wrapped with <div> tags, the same as previous versions. The old mail scripts still work. However, the administrator does not enjoy the benefits of working in the rich HTML format, and does not have as much control over exact HTML formatting.

**HTML line breaks in new scripts**

When writing new scripts, insert explicit HTML line breaks and clear the Newlines to HTML check box so that no HTML tags are injected when email notifications are generated. For existing notifications and templates, replace template.print("\n") JavaScript function calls with template.print("<br />"). This replacement gives you better control over the HTML formatting of your email notifications.

**Preview email notifications**

You can preview what notifications look like before you actually enable the instance to send them.

Role required: admin

---

**Note:** If you are using Internet Explorer, you must have version 9 or later to use this feature.

You can preview both types of notifications as specified by the Send when field on the Notification form:

- Record inserted or updated: A change to record in the instance triggers the notification.
- Event is fired: An event, such as expiration of a certificate or an inbound email action, triggers the notification.

1. Navigate to System Notification Email Notifications.
2. Open the notification or create one. You must save the record before you can view the preview accurately.
3. Click the Preview Notification UI action on the top of the form. The Notification Preview window opens.
4. You can see the content of the notification, modify the preview records to see what changes take place in the notification content, and view who can receive the notification (see table for field descriptions).
Notification Preview

Preview Records
Event Creator | Preview Record
System Administrator | CHG0000001

Users
ITIL User

Subject
Change Request CHG0000001 notification -- Rollback Oracle Version

Body
Short description: Rollback Oracle Version
Click here to view Change Request: CHG0000001

State: New
Category: Software
Configuration item: Sales Force Automation
Opened by: System Administrator
Assignment group:
Assigned to: ITIL User

Description:
Performance of the Siebel SFA software has been severely degraded since the upgrade performed this weekend.

We moved to an unsupported Oracle DB version. Need to rollback the Oracle Instance to a supported version.

Comments and Work notes:
## Table 120: Notification preview

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Event Creator</td>
<td>The user triggering the notification for the purpose of the preview. The event creator defaults to the user who clicked Preview Notification. You can change the creator as needed. You can change the preview record as needed to see the changes in the notification content.</td>
</tr>
<tr>
<td>Preview Record</td>
<td>The record triggering the notification for the purpose of the preview. The preview record defaults to one of the records in the table specified in the Table field on the Email Notification form. You can change the preview record as needed to see the changes in the notification content.</td>
</tr>
<tr>
<td>Event type</td>
<td>The type of event that triggers the notification. This choice list appears if you preview an event-triggered notification. Select one of the following:</td>
</tr>
<tr>
<td></td>
<td>• Generated Event: Preview the notification with a generic event that the previewer creates. This does not actually generate an event record.</td>
</tr>
<tr>
<td></td>
<td>• Existing Event: Preview with an existing event record in the instance. If you select this option, select the event in the Event Record field.</td>
</tr>
<tr>
<td>Event Record</td>
<td>An existing event to preview an event-created notification. This option appears if you select Existing Event as the event type (for event-triggered notifications only).</td>
</tr>
</tbody>
</table>
Field | Description
---|---
Users | The users who will receive the notification, as specified in the Who will receive section of the Email Notification form:
  - All users that you specify on the form appear, but only the users that will actually receive the notification with the current preview settings appear in black text.
  - Users that are specified but for whatever reason will not receive the notification appear in red, strikethrough text. Place the cursor over any of these names to see the reason the user will not receive the notification. For example, one reason could be that the user's notification settings are disabled.

Subject and Body | The content of the notification as defined by the template. The Subject and Body sections on the preview display the content in the corresponding Subject and Message fields on the template.

If the template includes a link to the record that triggered the notification, the Preview Record link is used. Click the link to go to that record.

5. Click the X at the top of the preview window to close it.
6. Make the necessary changes to the notification or template, if necessary.

**Time zone for email notifications**
A system property controls the time zone that the instance uses for the date and time stamp of a message.

The date and time stamp of a notification uses the system time zone, not the time zone of any recipient. The email property glide.email.append.timezone controls whether to append the time zone. If true, the system time zone of the instance is appended to any dates or date/times in outbound email messages (for example, 2010-07-02 04:01:14 PST).

**Specify alternative outbound email addresses for notifications**
By default, the system sends all outbound email notifications from the default email address of the instance, but you can specify an alternative address.

Role required: admin

For organizations that need to send email messages from specific email addresses, such as from multiple service desks, or they want to send notifications in different languages, the platform supports configuring multiple outbound addresses.

1. Navigate to System Notification Email Notifications.
2. Select an existing notification record for the desired event, such as Incident Closed.
3. Create a copy of this notification for each outbound email address.
4. Open one of the notification copies, and click the Advanced view related link.
5. In the What it will contain section, add an email address to the From field that is different from the default instance address.

6. Add a different email address than the From address to the Reply to field if you want replies to this notification to go to a different address.

   The system checks the From field for an address. If this field is empty, then the system uses the default address for the instance. If the Reply to field is empty, then all replies are sent to the address from which the notification was sent. If the Reply to field contains an email address, then the system sends all replies to the notification to this address.

7. Create mutually-exclusive conditions for notifications of the same type, so only the desired notification is sent when the event is fired.

   For example, if the Company is a certain value, then the notification comes from a unique email address entered in the From field.

8. Click Update.

Specify an outbound email address for a particular language
You can specify a different email address for each language your instance supports.

Role required: admin

1. Create or copy a notification record for the desired event.
2. In the What will it contain section, enter a new email address in the From field.
3. Create the Subject and Message content in the desired language.
4. In the When to send section, create a condition as follows:
   1. In the list of Condition fields, select Show Related Fields from the bottom of the choice list.
   2. From the choice list of Related Fields, select the field that identifies the recipient.
      For example, select Caller User fields to send the notification to the user who called in an incident, or Assigned to User fields to send the notification to the user to whom an incident is assigned.
   3. From the choice list of user fields, select Language.
   4. Select the is operator.
   5. Complete the condition by selecting the language of the desired user.

5. Click Update.

   All notifications for that event originate from the specified email address and go out in the language of the recipient.

Notification variables
Use notification variables to display dynamic information in the body of a notification such as a field value, a link to a record, or a link to system preferences.

Syntax

Specify a notification variable using this syntax:

```
${variable-name+variable-parameters}
```

The variable-name portion is always required. Not all notification variables support the variable-parameters portion. When available, most variable parameters are optional. See the list of available notification variables for variable names and available parameters.
### Available variables

The system provides these notification variables.

**Table 121: Available notification variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Available parameters</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>${field-name}</code></td>
<td>Display the value of the specified field.</td>
<td>None</td>
<td>Source: Incident ${number} - comments added Output: Incident INC1000001 - comments added</td>
</tr>
<tr>
<td><code>${image-field-name}</code></td>
<td>Display an image associated with a record. This variable is typically used with HTML to specify the source of an image element.</td>
<td>None</td>
<td>Source: <code>&lt;img src='</code>${picture}<code>?t=medium'/&gt;</code> Output:</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
<td>Available parameters</td>
<td>Example</td>
</tr>
<tr>
<td>--------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>• ${URI}</td>
<td>Display a link to the current record.</td>
<td>Any valid sysparm URL parameter. For example:</td>
<td>$(URI) Source: Click here to view incident: $(URI) $(URI) Output: Click here to view incident: LINK $(URI_REF) Source: Click here to view incident: $(URI_REF) $(URI_REF) Output: Click here to view incident: INC0000055</td>
</tr>
<tr>
<td>• ${URI_REF}</td>
<td>• URI: The link text is the word <em>LINK</em>.</td>
<td>• sysparm_scriptlet • sysparm_view</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• URI_REF: The link text is the display value of the record.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• $(reference-field.URI)</td>
<td>Display a link to the record listed in a reference field.</td>
<td>Any valid sysparm URL parameter. For example:</td>
<td>Source: Click here to view Incident: $(URI_REF) Click here to view Related Problem: $(problem_id.URI_REF) Output:</td>
</tr>
<tr>
<td>• $(reference-field.URI_REF)</td>
<td>• URI: The link text is the word <em>LINK</em></td>
<td>• sysparm_scriptlet • sysparm_view</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• URI_REF: The link text is the display value of the record.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>${{CMS_URI}}</td>
<td>Display a link to the specified record within a CMS page.</td>
<td>&lt;CMS-site&gt;/&lt;CMS-page&gt;: The required relative path to the CMS page.</td>
<td>Source: $ {{CMS_URI} +ess/incident_detail} Output: a link to a target CMS page such as https://&lt;instance name&gt;.service-now.com/ess/incident_detail.do?sysparm_document_key=incident,46e18c0fa9fe19810066a0083f76bd56</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
<td>Available parameters</td>
<td>Example</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>${notification:body}</td>
<td>Display the body contents of an email template or email notification. Use this notification variable to specify where to display body content in an email layout.</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>${mail_script:script-name}</td>
<td>Run the specified mail script.</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>${NOTIF_UNSUB}</td>
<td>Display a link unsubscribe from this notification.</td>
<td>link_text: specify the text to display as a link within quotation marks.</td>
<td></td>
</tr>
<tr>
<td>${NOTIF_PREFS}</td>
<td>Display a link to set notification preferences.</td>
<td>link_text: specify the text to display as a link within quotation marks.</td>
<td></td>
</tr>
</tbody>
</table>
**Links to records in email notifications**

Adding the ${URI} parameter to an outbound email body or template creates a link to a specific record.

When a user clicks the word LINK, the instance prompts the user to log in if not already logged in, and then redirects the user to the record specified in the URI.

![Short description: SAP Sales app is not accessible](image)

**Figure 158: Link displayed by ${URI} parameter**

The ${URI} parameter has an extension called the ${URI+} format to specify additional arguments in the email link, such as sysparm terms, in addition to the automatically created URI. For example (whitespace added for improved readability):

```
${URI+&sysparm_scriptlet=current.assigned_to=gs.getUserID()
 &sysparm_scriptlet_condition=current.assigned_to.nil()
 &sysparm_view=incident_active}
```

This example executes the JavaScript:

```javascript
current.assigned_to=gs.getUserID()
```

when the condition of

```javascript
current.assigned_to.nil()
```

is satisfied. Additionally, the script sets the view to incident_active.

Enable links to records

Adding the special ${URI} parameter to an outbound email body or template creates a link to a specific record.

When a user clicks the word LINK, the instance prompts the user to log in if not already logged in, and then redirects the user to the record specified in the URI.

![Short description: SAP Sales app is not accessible](image)

**Figure 159: URI email notification**

The ${URI} parameter has an extension called the ${URI+} format to specify additional arguments in the email link, such as sysparm terms, in addition to the automatically created URI. For example (whitespace added for improved readability):

```
${URI+&sysparm_scriptlet=current.assigned_to=gs.getUserID()
 &sysparm_scriptlet_condition=current.assigned_to.nil()
 &sysparm_view=incident_active}
```

This example executes the JavaScript:

```javascript
current.assigned_to=gs.getUserID()
```
when the condition of
current.assigned_to.nil()

is satisfied. Additionally, the script sets the view to incident_active.

Change the link text
To show the display value of the record as the link text instead of the word LINK, use the ${URI_REF} parameter instead of the ${URI} parameter.

![Short description: SAP Sales app is not accessible](image)

Click here to view incident: INC0000055

Comments:

Figure 160: URI_REF email notification

For example, if the URL displays an incident record, the link text is the incident number, which is the display value for incidents. If the URL displays a user record, then the link text is the user name.

Link to related records
A notification can link to a related record by specifying a reference field in front of the ${URI} or ${URI_REF} parameters.

Format the related record link as follows:
- ${<reference field that contains the related record you want to display>.URI}
- ${<reference field that contains the related record you want to display>.URI_REF}

For example:

<table>
<thead>
<tr>
<th>Related record to provide link to</th>
<th>Notification record table</th>
<th>Reference field</th>
<th>Samples</th>
</tr>
</thead>
</table>
| Related task record to be approved from an approval notification | Approval [sysapproval_approver] | Approval for [sysapproval] | • ${sysapproval.URI}
  • ${sysapproval.URI_REF} |
| Related problem record in an incident notification | Incident | Problem [problem_id] | • ${problem_id.URI}
  • ${problem_id.URI_REF} |

For example, the following notification template produces the email links in the picture below:

Click here to view Incident: ${URI_REF}
Click here to view Related Problem: ${problem_id.URI_REF}

Click here to view Incident: INC0010002
Click here to view Related Problem: PRB0040001

Figure 161: Related record link
Content page links in email notifications
Links to CMS pages can be put in notifications to make it easy for the reader to access the pages.

The link takes the following format: `${CMS_URI+<site>/<page>}`.

For example, to link the email recipient to a page called Incident in the content site ESS, with the current incident as the target document, use the following format: `${CMS_URI+ess/incident_detail}`

The resulting email URL has this format: https://<instance name>.service-now.com/ess/incident_detail.do?sysparm_document_key=incident,46e18c0fa9fe19810066a0083f76bd56

Email unsubscribe
Administrators can add unsubscribe links to notifications so that users can stop receiving particular email messages.

Note: The base system notifications include unsubscribe and notification preferences links.

The system offers two types of macros to create unsubscribe links.
• An unsubscribe link that creates an email message to the instance.
• An unsubscribe link that opens the notification preferences for the user on the instance.

Table 123: Available unsubscribe macros

<table>
<thead>
<tr>
<th>Unsubscribe type</th>
<th>Macro used</th>
<th>Description</th>
<th>Available parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unsubscribe by email (Unauthenticated)</td>
<td>${NOTIF_UNSUB}</td>
<td>The system generates an HTML mailto hyperlink. When users click the link, their browser or email client creates a pre-formatted unsubscribe email message to the instance.</td>
<td>link_text: specify the text to display as a link within quotation marks.</td>
</tr>
<tr>
<td>Unsubscribe by notification preferences (Authenticated)</td>
<td>${NOTIF_PREFS}</td>
<td>The system generates an instance link directly to the notification preferences for this notification type.</td>
<td>link_text: specify the text to display as a link within quotation marks.</td>
</tr>
</tbody>
</table>

Administrators can add unsubscribe macros to any notification record type such as:
• Email layouts
• Email templates
• Email notifications

Unsubscribe by email

Unsubscribe by email requires the user email client or browser to create a pre-formatted email message containing these elements:
• The To field has the email address of the instance.
• The Subject starts with the string Unsubscribe from.
• The Body has a JSON string with a name-value pair of Unsubscribe and an array value that contains two more name-value pairs.
  • The notification_id parameter specifies the Sys ID of the notification the user wants to unsubscribe from.
  • The unsub_token parameter specifies an instance ID the system uses to verify that the email came from a ServiceNow instance.

---

**Note:** Some email clients and web browsers, such as GMail on Chrome, require extra client configuration to support mailto hyperlinks. Administrators can provide an alternative unsubscribe method for users whose email client or browser does not support mailto links. See [RFC6068](http://example.com/rfc6068) for information about the mailto URI scheme.

The Unsubscribe from Notification inbound action processes the email and unsubscribes the sender from the listed notification.

---

**Note:** Unsubscribing by email message does not require users to authenticate with the instance first.

---

### Unsubscribe by notification preferences

Unsubscribe by notification preferences requires the user’s browser to navigate to the notification preferences page on the instance. After logging in, the system displays the notification preferences for this particular notification.

Users can set preferences for this notification such as disabling notifications for a particular device. Users must save their notification preferences for changes to take effect.

**Unsubscribe links**

This email layout adds several unsubscribe links to the bottom of each email notification.

`${NOTIF_UNSUB}` from this notification by email or `${NOTIF_UNSUB+link_text="click here"}`.

Manage your `${NOTIF_PREFS}` or `${NOTIF_PREFS+link_text="click here"}`.

When rendered in an email notification, the unsubscribe links only display the link text.
INC0013461 - How do I unsubscribe from an email?

An incident has been opened on your behalf.
You can view all the details of the incident by following the link below:

Take me to the Incident

Thank you.

Unsubscribe from this notification by email or click here.
Manage your Notification Preferences or click here.

Ref: MSG0006989

Figure 162: Sample email with unsubscribe links

If a user clicks the Unsubscribe link, the email client creates a message such as this:
Scripting for email notifications

Email scripts allow for business rule-like scripting within an outbound email message.

With mail scripts, you can dynamically change the email output of your system based on different criteria. Mail scripts allow you to perform simple tasks, such as displaying incident data, and complex ones, such as making advanced database queries.

You can add a ${mail_script:script name} embedded script tag to the body of the email notification or template, replacing script name with the name of the script you created. This makes it easy to use the same scripts in multiple email notifications or templates.

If you manually enter a mail script bounded by <mail_script> and </mail_script> in the body of a new or converted email notification or template, and then attempt to save the record, a message asks whether the mail script should be converted. In many cases, an unconverted mail script fails to run from inside the HTML editor. If you select Yes, the script is added to the Email Script [sys_script_email] table and is automatically replaced in the body with an embedded script tag (${mail_script:script_name}).

JavaScript in emails

Create mail scripts in System Notifications Email Notification Email Script, and refer to them by using ${mail_script:script name} in the script field.

To print text into the body of the message, use the template.print("a string") function.
Figure 164: JavaScript in templates

The event.parm1 and event.parm2 parameters that come from the originating event can also be used.

Mail script API

Certain variables are available when processing mail_script scripts.

Table 124: Mail script variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Object Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>template</td>
<td>Handles printing from the mail script to the email message.</td>
</tr>
<tr>
<td></td>
<td>template.print(&quot;message&quot;); //outputs message to the email body.</td>
</tr>
<tr>
<td></td>
<td>template.space(&quot;number of spaces&quot;); //outputs spaces to the email body.</td>
</tr>
<tr>
<td>email_action</td>
<td>GlideRecord object for the email notification (sysevent_email_action).</td>
</tr>
<tr>
<td>event</td>
<td>GlideRecord object for the event that fired the notification (sysevent).</td>
</tr>
<tr>
<td>Variable</td>
<td>Object Description</td>
</tr>
<tr>
<td>----------</td>
<td>-------------------</td>
</tr>
<tr>
<td>email</td>
<td>EmailOutbound object</td>
</tr>
</tbody>
</table>

Available methods:
- `addAddress(String type, String address, String displayname):` type can be cc or bcc.
- `setFrom(String address):` override the sender address.
- `setReplyTo(String address):` override the reply to address.
- `setSubject(String subject):` override the subject of the message.
- `setBody(String message):` override the body of the message.

The email address that is passed by `setFrom` and `setReplyTo` needs to be in a valid form such as `helpdesk@sn.com` or `Display Name <helpdesk@sn.com>`. If the email address includes a 'Display Name', then that value overrides the instance's display name.

Example scripting for email notifications

Examples of scripting for email notifications.

Scripting examples for email notifications

A simple text string is the most basic example of the way a mail script works. This script prints out "Incident number - INC00001".

```plaintext
    template.print("Incident number - "+ current.number);
```

More advanced scripts, like this one, can be found by browsing through the base system email templates.

```plaintext
    template.print("Summary of Requested items:<br />
    var gr = new GlideRecord("sc_req_item");
gr.addQuery("request", current.sysapproval);
gr.query();
    while(gr.next()) {
        template.print(gr.number +": " + gr.quantity + " X " + 
gr.cat_item.getDisplayValue()
            + " at " + gr.cat_item.price.getDisplayValue() + " each 
<br />
    }
```

To dynamically change field values within an email, use the following functions within `<mail_script>` syntax:

```plaintext
    ... 
    email.setFrom(current.caller_id.email);
    email.setReplyTo("joe.employee@yourcompany.com");
    email.setSubject("This is the new subject line");
    email.setBody("This is the new body");
    ...
```

Using the `instance_name` property ensures that the notification still works when migrated between instances.
function dothis()
{
    var gr = new GlideRecord('sys_attachment');
    gr.addQuery('table_sys_id', current.sys_id);
    gr.query();
    while (gr.next()){
        template.print('Attachment: <a href="https://' +
        gs.getProperty('instance_name')+ '.service-now.com/sys_attachment.do?sys_id='+
        gr.sys_id+'">' +
        gr.file_name+'</a>');
    }
}

You can specify copied and blind copied recipients by using the email object within a mail script.

//email.addAddress(type, address, displayname);
email.addAddress("cc", "john.copy@example.com", "John Roberts");
email.addAddress("bcc", "john.secret@example.com", "John Roberts");

The following is an example script to add users from watch_list as copied recipients.

if(!current.watch_list.nil()){
    //get watch list addresses and add to cc
    var watcherIds = current.watch_list.split 
    var user = new GlideRecord("sys_user");
    user.addQuery("sys_id", watcherIds);
    user.addQuery("notification", 2);
    //email
    user.addQuery("email", "!=", "");
    user.query();

    while (user.next()){
        //add to cc list
        email.addAddress("cc", user.email, user.getDisplayValue());
    }
}

Useful attachment scripts
This is a searchable version of the Useful Attachment Scripts.

Caution: The customization described here was developed for use in specific instances, and is not supported by ServiceNow Customer Support. This method is provided as-is and should be tested thoroughly before implementation. Post all questions and comments regarding this customization to our community forum.

Table 125: Useful attachment scripts

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Table</th>
<th>Description</th>
<th>Parameters</th>
<th>Script</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copy Attachments from Record to Record</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>GlideSysAttachment.copy('sourcetable', 'sys_id', 'destinationtable', 'sys_id');</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Note: GlideSysAttachment.copy copies all attachments; it cannot select specific attachments.</td>
</tr>
<tr>
<td>Name</td>
<td>Type</td>
<td>Table</td>
<td>Description</td>
<td>Parameters</td>
<td>Script</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------------------------------</td>
<td>------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>------------</td>
<td>--------</td>
</tr>
</tbody>
</table>
| Delete Duplicate Attachments| business rule, scheduled job, background script | sys_attachment         | This script will delete duplicate images located in the attachments table. | None        | function fixDuplicateImages() {
  var gr = new GlideRecord('sys_attachment');
  gr.addQuery('table_name', 'LIKE', '%ZZ_YY%');
  gr.orderBy('table_sys_id');
  gr.orderByDesc('sys_created_on');
  gr.query();
  var lastID = 'not_a_match';
  var lastFile = 'not_a_match';
  while (gr.next()) {
    var isDuplicate = (lastID == gr.table_sys_id) && (lastFile == gr.file_name);
    lastID = gr.table_sys_id;
    lastFile = gr.file_name;
    gs.print(gr.table_sys_id + ' ' + gr.table_name + ' ' + gr.file_name + ' ' + gr.sys_created_on + isDuplicate); if (isDuplicate) {
        gr.deleteRecord();
    }
}
<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Table</th>
<th>Description</th>
<th>Parameters</th>
<th>Script</th>
</tr>
</thead>
</table>
| Display Whether Tasks Have Attachments in List View | Business Rule | Attachments [sys_attachment] | Displays whether tasks have attachments when viewed in the record list view. Note that the script needs a custom field on the task table named Has Attachments (u_has_attachments). | when: after insert/delete | function checkAttachment() {
  // if inserting then the task has an attachment
  if (current.operation() == 'insert') {
    hasAttachment('true');
  }
  // if deleting attachment check for other attachments
  if (current.operation() == 'delete') {
    var timeNow3 = new GlideDateTime();
    gs.log('has_attachment br: gliderecord query start date time is: ' + timeNow3.getNumericValue(), 'jwtest');
    var attachCount = new GlideAggregate('sys_attachment');
    attachCount.addQuery('table_sys_id', current.sys_id);
    attachCount.addAggregate('COUNT');
    attachCount.query();
    var numAttachments = '0';
    // if no other attachments task does not have attachment
    if (attachCount.next()) {
      numAttachments = attachCount.getAggregate('COUNT');
      if (numAttachments > 0) {
        hasAttachment = 'true';
      } else {
        hasAttachment = 'false';
      }
    }
  }
  var timeNow4 = new GlideDateTime();
  gs.log('has_attachment br: gliderecord query start date time is: ' + timeNow4.getNumericValue(), 'jwtest');
  hasAttachment = 'true';
} }
<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Table</th>
<th>Description</th>
<th>Parameters</th>
<th>Script</th>
</tr>
</thead>
<tbody>
<tr>
<td>Include Attachments in an Email Notification</td>
<td></td>
<td></td>
<td>Include this in the email notification or template to include attachments. Replace INSTANCE with your instance name.</td>
<td></td>
<td>printattachments(); function printattachments() {var gr = new GlideRecord('sys_attachment'); gr.addQuery('table_sys_id', current.sys_id); gr.query(); while(gr.next()) { template.print('Attachment: [a href=&quot;http://'+gs.getProperty('instance_name')+'.servicenow.com/sys_attachment.do?sys_id='+gr.sys_id+'&quot;&gt;'+gr.file_name+'&lt;/a&gt;');}}</td>
</tr>
</tbody>
</table>

**Attachment Logging**

Whenever a user downloads an attachment, the action writes an attachment.read event record to the event log. If desired, you can process these events with a Script Action or an Email Notification. This can be useful if you want to do something when an attachment is read. For example, you can record when and by whom certain attachments are downloaded. For this functionality, the current variable must point to a sys_attachment record, and the event record must use the following parameters:

- parm1: File name
- parm2: Table name

**Notification examples**

There are several examples that illustrate how to set up email and SMS notifications.

The two processes are identical, with the exception of the length and content of the message. SMS messages do not permit user response to links and are limited to 140 characters. Use the SMS alternate field in the Email Template and Email Notification forms to create a brief text message for SMS devices.

**Baseline email notifications**

The baseline system provides several email notifications.

Some events listed in this table do not appear in a business rule and are fired by other conditions in the platform. Some events are hardcoded and are not user configurable.
### Table 126: Baseline email notification descriptions

<table>
<thead>
<tr>
<th>Email notification</th>
<th>Description</th>
<th>Triggering event</th>
<th>Business Rule Controlling Event</th>
</tr>
</thead>
</table>
| **Appointment Invite** | Type: Meeting Invitation  
Adds a meeting invitation to the recipient’s calendar by sending an iCalendar formatted email | itil_appointment.inserted | Global business rule |
| **Appointment Update** | Type: Meeting Invitation  
Updates an existing meeting in the recipient’s calendar by sending an iCalendar formatted email | itil_appointment.updated | Global business rule |
| **Approval Rejected** | Type: EMAIL  
An approval has been rejected – includes the approver’s name. | approval.rejected | approver events |
| **Approval Rejected by Other** | Type: EMAIL  
An approval has been rejected – includes the approver’s name. | approval.rejected.by.other | approver events |
| **Approval Request** | Type: EMAIL  
Sends an email for the recipient to reply with an approval decision. In the approval email, the recipient selects a link that builds the appropriate reply email. | approval.inserted | approver changes |
| **Catalog Approval Rejected** | Type: EMAIL  
A catalog request has been rejected – includes the approver’s name. | request.approval.rejected | approval events |
| **Catalog Approval Request** | Type: EMAIL  
A catalog request for which you were an approver has been cancelled. | request.approval.cancelled | approver changes |
<table>
<thead>
<tr>
<th>Email notification</th>
<th>Description</th>
<th>Triggering event</th>
<th>Business Rule Controlling Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catalog Approval Request</td>
<td>Type: EMAIL</td>
<td>request.approval.inserted</td>
<td>request.approval.inserted</td>
</tr>
<tr>
<td></td>
<td>A catalog request for which you are an approver has been made.</td>
<td></td>
<td>approval events</td>
</tr>
<tr>
<td>Certificate Expired</td>
<td>Type: EMAIL</td>
<td>certificate.expired</td>
<td>certificate events</td>
</tr>
<tr>
<td></td>
<td>Notification that the X.509 certificate has expired.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certificate Expiring</td>
<td>Type: EMAIL</td>
<td>certificate.expiring</td>
<td>certificate events</td>
</tr>
<tr>
<td></td>
<td>Notification that the X.509 certificate is expiring in N days.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change approved</td>
<td>Type: EMAIL</td>
<td>change.approved</td>
<td>Change events and task events</td>
</tr>
<tr>
<td></td>
<td>A change request has been approved.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change assigned to me</td>
<td>Type: EMAIL</td>
<td>change.assigne</td>
<td>Change events</td>
</tr>
<tr>
<td></td>
<td>A change request has been assigned to you.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change assigned to my group</td>
<td>Type: EMAIL</td>
<td>change.assigne.to.group</td>
<td>Change events</td>
</tr>
<tr>
<td></td>
<td>A change request has been assigned to your group.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change commented (to assignee)</td>
<td>Type: EMAIL</td>
<td>change.commented</td>
<td>Change events</td>
</tr>
<tr>
<td></td>
<td>A comment has been added to a change request. The person assigned to the change request receives an email notification.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change commented (unassigned)</td>
<td>Type: EMAIL</td>
<td>change.commented</td>
<td>Change events</td>
</tr>
<tr>
<td></td>
<td>A comment has been added to a change request. The assignment group assigned to the change request receives an email notification.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Email notification</td>
<td>Description</td>
<td>Triggering event</td>
<td>Business Rule Controlling Event</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>Change Notification</td>
<td>Type: EMAIL</td>
<td>label.notify</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Notification of a change in the fields label in a form.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change rejected</td>
<td>Type: EMAIL</td>
<td>change.rejected</td>
<td>Change events and task events</td>
</tr>
<tr>
<td></td>
<td>A change request has been rejected.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change Task worknoted (unassigned)</td>
<td>Type: EMAIL</td>
<td>change_task.worknoted</td>
<td>Change task events</td>
</tr>
<tr>
<td></td>
<td>A work note has been added to a change task. The assignment group assigned to the change task receives an email notification.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change Task worknoted (to assignee)</td>
<td>Type: EMAIL</td>
<td>change_task.worknoted</td>
<td>Change task events</td>
</tr>
<tr>
<td></td>
<td>A work note has been added to a change task. The person assigned to the change task receives an email notification.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change Task assigned to my group</td>
<td>Type: EMAIL</td>
<td>change_task.assigned.to</td>
<td>Change task events</td>
</tr>
<tr>
<td></td>
<td>A change task has been assigned to your group.</td>
<td>group</td>
<td></td>
</tr>
<tr>
<td>Change Task assigned to me</td>
<td>Type: EMAIL</td>
<td>change_task.assigned</td>
<td>Change task events</td>
</tr>
<tr>
<td></td>
<td>A change task has been assigned to you.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change worknoted (to assignee)</td>
<td>Type: EMAIL</td>
<td>change.worknoted</td>
<td>Change events</td>
</tr>
<tr>
<td></td>
<td>A work note has been added to a change request. The person assigned to the change request receives an email notification.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Email notification</td>
<td>Description</td>
<td>Triggering event</td>
<td>Business Rule Controlling Event</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>Change worknoted (unassigned)</td>
<td>Type: EMAIL</td>
<td>change.worknoted</td>
<td>Change events</td>
</tr>
<tr>
<td></td>
<td>A work note has been added to a change request. The assignment group assigned to the change request receives an email notification.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Email assigned to</td>
<td>Type: EMAIL</td>
<td>incident.assigned</td>
<td>incident.events</td>
</tr>
<tr>
<td></td>
<td>An incident has been assigned to you (the recipient of the email).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Email assigned to (sc_task)</td>
<td>Type: EMAIL</td>
<td>sc_task.assigned.to.user</td>
<td>sc_task_events</td>
</tr>
<tr>
<td></td>
<td>A task has been assigned to you (the recipient of the email).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
This email notification was used for the legacy Delivery Plan system of email notifications. In order to use this email notification with a workflow, the work_start field needs to be set by the workflow using a Set Value activity.

<p>| Email assigned To Group             | Type: EMAIL                                                                 | incident.assigned.to.group | incident.events                 |
|                                    | An incident has been assigned to an assignment group of which you are a member (the recipient of the email). |                        |                                 |</p>
<table>
<thead>
<tr>
<th>Email notification</th>
<th>Description</th>
<th>Triggering event</th>
<th>Business Rule Controlling Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email assigned to group (sc_task)</td>
<td>Type: EMAIL</td>
<td>sc_task.assigned.to.group</td>
<td>sc_task_events</td>
</tr>
<tr>
<td></td>
<td>A Service Catalog task has been assigned to an assignment group of which you are a member (the recipient of the email).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incident Closed</td>
<td>Type: EMAIL</td>
<td>incident.updated</td>
<td>incident_events</td>
</tr>
<tr>
<td></td>
<td>An incident opened by you (the recipient of the email), has been closed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incident Commented</td>
<td>Type: EMAIL</td>
<td>incident.commented</td>
<td>incident_events</td>
</tr>
<tr>
<td></td>
<td>An incident opened by you (the recipient of the email) has had comments added. This notification uses a template for an employee self-service (ESS) user.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incident Commented</td>
<td>Type: EMAIL</td>
<td>incident.commented</td>
<td>incident_events</td>
</tr>
<tr>
<td></td>
<td>An incident assigned to you (the recipient of the email) has had comments added. This notification uses a template for an ITIL user.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incident Opened</td>
<td>Type: EMAIL</td>
<td>incident.inserted</td>
<td>incident_events</td>
</tr>
<tr>
<td></td>
<td>An incident has been opened for you (the recipient of the email) by someone else. This notification uses a template for an employee self-service (ESS) user.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Email notification</td>
<td>Description</td>
<td>Triggering event</td>
<td>Business Rule Controlling Event</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-----------------------</td>
<td>---------------------------------</td>
</tr>
</tbody>
</table>
| Incident Opened & Unassigned       | Type: EMAIL  
An incident has been opened and is unassigned. This notification uses a template for an ITIL user. | incident.inserted     | incident events                 |
| Incident Resolved                  | Type: EMAIL  
An incident opened by you has been resolved, and feedback is required to determine if the incident should be closed. | incident.updated      | incident events                 |
| Knowledge Closed Created            | Type: EMAIL  
A contributor’s submission to the Knowledge Base was accepted and an article was created. | kb.submission.closed_created |                               |
| Knowledge Closed Duplicate         | Type: EMAIL  
A contributor’s submission to the Knowledge Base was determined to be a duplicate, and no article was created. | kb.submission.closed_duplicate |                               |
| Knowledge Closed Invalid           | Type: EMAIL  
A contributor’s submission to the Knowledge Base was determined to be invalid (unusable). | kb.submission.closed_invalid |                               |
| Notify Change Calendar             | Type: Meeting Invitation  
Notifies the recipients of the schedule for a change request and exports the schedule to the Microsoft Outlook calendar. The email is in the format of iCalendar formatted email. | change.calendar.notify | change events                   |
<table>
<thead>
<tr>
<th>Email notification</th>
<th>Description</th>
<th>Triggering event</th>
<th>Business Rule Controlling Event</th>
</tr>
</thead>
</table>
| Notify Change Calendar Remove    | Type: Meeting Invitation  
Notify the recipients that a scheduled change has been closed or assigned to someone else and removes the entry from the Microsoft Outlook calendar. The email is in the format of iCalendar formatted email.                                                                                                                | change.calendar.notify.remove           | change events                   |
| Problem Task assigned to me      | Type: EMAIL  
A problem task has been assigned to you.                                                                                                                                                                                                                                                                                                                                                         | problem_task.assigned                   | Problem task events             |
| Problem Task assigned to my group| Type: EMAIL  
A problem task has been assigned to your group.                                                                                                                                                                                                                                                                                                                                                        | problem_task.assigned.to.group          | Problem task events             |
| Problem Task worknoted (to assignee) | Type: EMAIL  
A work note has been added to a problem task. The person assigned to the problem task receives an email notification.                                                                                                                                                                                                                          | problem_task.worknoted                  | Problem task events             |
| Problem Task worknoted (unassigned) | Type: EMAIL  
A work note has been added to a problem task. The assignment group assigned to the problem task receives an email notification.                                                                                                                                                                                                                      | problem_task.worknoted                  | Problem task events             |
| Problem worknoted (to assignee)  | Type: EMAIL  
A work note has been added to a problem. The person assigned to the problem receives an email notification.                                                                                                                                                                                                                                                                                 | problem.worknoted                       | Problem events                  |
<table>
<thead>
<tr>
<th>Email notification</th>
<th>Description</th>
<th>Triggering event</th>
<th>Business Rule Controlling Event</th>
</tr>
</thead>
</table>
| Problem worknoted (unassigned)        | Type: EMAIL
A work note has been added to a problem. The assignment group assigned to the problem receives an email notification. | problem.worknoted    | Problem events                  |
| Reminder Insert                       | Type: Meeting Invitation
Creates a calendar reminder regarding an open task. The email is in the format of iCalendar formatted email. | reminder.notify      |                                 |
| Reminder Insert                       | Type: Meeting Invitation
A task has been closed or deleted. This notification removes the task reminder from Outlook. The email is in the format of iCalendar formatted email. | reminder.notify.delete |                                 |
| Reminder Insert Email                 | Type: EMAIL
Sends the recipient a reminder email about a specific task.                  | reminder.notify.email |                                 |
| Request Approved                      | Type: EMAIL
A Service Catalog request, opened by the recipient, has been approved.        | sc_request.approved    | sc_request events               |
| Request Assigned                      | Type: EMAIL
A Service Catalog request has been assigned to the recipient.                 | sc_request.assigned    | sc_request events               |
| Request Completed                     | Type: EMAIL
A Service Catalog request, opened by the recipient, has been completed.       | sc_request.updated     | sc_request events               |
<table>
<thead>
<tr>
<th>Email notification</th>
<th>Description</th>
<th>Triggering event</th>
<th>Business Rule Controlling Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Request Item Assigned</td>
<td>Type: EMAIL</td>
<td>sc_req_item.assigned</td>
<td>sc_request events</td>
</tr>
<tr>
<td></td>
<td>An item requested from the Service Catalog has been assigned to you.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Request Item Delivery</td>
<td>Type: EMAIL</td>
<td>sc_req_item.delivery</td>
<td>sc_request events</td>
</tr>
<tr>
<td></td>
<td>An item requested from the Service Catalog by the recipient is being delivered.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Request Opened on Behalf</td>
<td>Type: EMAIL</td>
<td>sc_request.requested_for</td>
<td>sc_request events</td>
</tr>
<tr>
<td></td>
<td>A Service Catalog request has been opened on behalf of the recipient.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reset Password</td>
<td>Type: EMAIL</td>
<td>reset.password</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The recipient’s password has been reset as requested.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scheduled Import Completed</td>
<td>Type: EMAIL</td>
<td>scheduled_import_set.completed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A scheduled import set has completed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>System Upgraded</td>
<td>Type: EMAIL</td>
<td>system.upgraded</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The recipient’s system has been upgraded.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task approved</td>
<td>Type: EMAIL</td>
<td>task.approved</td>
<td>Change events and task events</td>
</tr>
<tr>
<td></td>
<td>An ITIL task has been approved.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Text Index Completed</td>
<td>Type: EMAIL</td>
<td>text_index.complete</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A scheduled system index has completed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unscheduled Change</td>
<td>Type: EMAIL</td>
<td>cmdb.unscheduled.change</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A named configuration item has changed, and no active change request exists.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notification example: simple reminder
In this notification example, set up a very simple reminder that sends a user an email at a specified time, based on information in an incident.

Role required: admin

We will create the following:

- A custom date/time field on the Incident form
- A business rule to define an event based on the new field
- An email notification to react to that event

1. Create a custom Date/Time field on the Incident form labeled Reminder, with a field name of u_reminder

![Incident Form Image]

2. Define an event that is triggered when the Reminder field gets a value. We create an event called incident.reminder that is triggered at a specific time. We use the gs.eventQueueScheduled() function, which is similar to the standard event creation function, but can pass a parameter to specify when the event is triggered. In this case, the event is triggered at the date and time specified in the new Reminder field.

   Note: Be sure to register your new event. If you do not, the system will not know to look for it.
3. Create an email notification record that reacts to the new incident.reminder event. This brief notification message is suitable for SMS as well.

```javascript
gs.eventQueueScheduled ( "incident.reminder", current, gs.getUserID ( ), gs.getUserName ( ), current.u_reminder );
```
Note: This is a very simple reminder. There is no condition in place to delete or reschedule the reminder event if the incident is deleted or if the date and time in the Reminder field is changed. The business rule, as presented, will schedule a new event every time the Reminder field is updated. Nothing is configured to display a reminder that is currently scheduled for an incident. However, this reminder is very simple and can be set up in just a few minutes.

Create a concept topic to introduce the background needed to perform this process or task.

Notification example: assignment notification

In this notification example, enhance the To Do application to send an email notification when someone is assigned a task.

Role required: admin

The email notification is triggered by an event, which is triggered by a business rule. Events can be triggered by business rules and, in turn, reacted to elsewhere. This event is triggered by the business rule created in the next procedure and will, in turn, trigger the email notification.

1. Navigate to System Policy Events Registry.
2. Click the New to create an event registry record.
3. Select the To_Do table.
4. Type A To Do has been assigned in the Description field.

Fired by is basically a comment to remind you where the events come from. We select Business Rule.

5. Click Submit.
7. Click New to create a business rule.
8. Fill in the fields as follows:
   - Name: To Do Assigned
   - Table: to_do
   - Run at: server
   - When: after
   - Insert: true
   - Update: true

9. Enter a condition to trigger the business rule whenever the Assigned to field is changed or initially populated:

   <font face = "Courier">
   current. u_assigned_to. changes ( ) </font face = "Courier">

10. Enter a script to add a to_do.assigned event.
11. In addition to the event name and the current record, specify two additional parameters (user’s ID and Name).

   <font face = "Courier">
   gs. eventQueue ( "to_do.assigned" , current , gs. getUserID ( ) , gs. getUserName ( ) ) ; </font face = "Courier">
12. Click Submit.
13. Test that the business rule is creating the event as follows:
   1. Change the value in the Assigned to field of an existing To Do record or create a new record and specify an Assigned to.
   2. Navigate to System Policy Events Event log and look for an event with the name to_do.assigned.
   3. To make this easier, you can sort the event log in descending order by created.
14. Navigate to System Notification Email Notifications.
15. Click New to create an email notification.
16. Fill in the following fields:
   • Name: To Do Assigned
   • Event name: to_do.assigned
   • Table name: to_do

   The User field specifies to whom the email should be sent. In this case, send it to the Assigned to user.
17. In User field, enter u_assigned_to.
   Sometimes, you do not want notifications to be sent to the person who triggered the notification. In this case, clear the Send to event creator check box. Select this option to see all the notifications.
18. Enter the Subject of the email as To Do Assigned.
19. Under Select variables, click Due Date.
You will see text added to the message text box which causes the value of the due date to be inserted. You can change the label (Due Date in this case) which was provided automatically. Use the same method to add two more variables to the message text: Priority and Short Description.

20. Click Submit.

21. **Warning:** Do not use your own POP server for this exercise. You should have a test account set up on your mail server (see the administrator of your mail system). It may download the contents of your POP account. You may choose to skip configuring Glide to use an email server and just check the Glide email log instead of sending an actual email (see final step below).

Navigate to System Properties Email.

22. Under SMTP Server Settings, enter the outgoing mail server, outgoing mail address, the mail server password, and outgoing mail display name.

23. If you are using a POP server, enter the POP server, incoming POP mail account name (do not include the @ and server name here), and incoming POP mail account password.

At the bottom of the form is a space where a test email account can be provided to direct emails to it instead of the actual email addresses. Rather than test emails sent to the test users, place your own email address here.
24. Click Save.
25. Test the assignment notifications.
   1. Assign some To Do records.
   2. Navigate to System Logs Email to see that status of generated emails.
      You should receive email notifications in a few moments.

Notification example: approval request
In this notification example, a change request approval is requested, which results in an update to the Approval [sysapproval_approval] table.

Role required: admin
The approval events Business Rule is executed which creates the approval.inserted event. The Approval Request email event is configured to process the approval.inserted event, which uses the change.itil.approve.role email template. This is part of an automatic response that enables the recipient to click a link in the email to send a pre-formatted response back to the system to either approve or reject the change request automatically.

1. Create an email notification that looks like this:
2. Create an email template like this:

The combination of the notification and template generates an email that looks something like the following:
Notice that the receiver of this email has the following links in the mail:

- A link to view the approval record
- A link to view all the details of the change request
- A link that generates an automatic email response to approve the change
- A link that generates an automatic email response to reject the change

Notification example: priority 1 incident update

In this notification example, configure the instance to notify specific users by email whenever an incident with a priority of 1 - Critical is updated, regardless of the changes that have been made.

Role required: admin

We will create an email notification to alert all recipients when the default system event incident.update is triggered for a priority 1 incident. The notification will display information of interest to the recipients, such as the incident number, category, assignees, and any comments that were added to the incident.

1. Navigate to System Notification Email Notifications, and then click New.
2. Configure the email notification record as follows.

<table>
<thead>
<tr>
<th>Field</th>
<th>Input Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Give your notification record a unique name, such as Incident of Priority 1 Updated.</td>
</tr>
<tr>
<td>User</td>
<td>Click the magnifying glass icon and select a recipient from the list of users. You can select only one user in this field.</td>
</tr>
<tr>
<td>Event name</td>
<td>Select the event to use for this notification. The incident.updated event is triggered by any change to an incident record and can be used to send our notification.</td>
</tr>
<tr>
<td>Field</td>
<td>Input Value</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>User field</td>
<td>Enter the field name from the Incident table that defines the recipient for this notification. For example, you might send notification of an update to the person who opened the incident by typing opened_by.</td>
</tr>
<tr>
<td>Email template</td>
<td>Leave this field blank. We will cover the construction and use of templates in another exercise.</td>
</tr>
<tr>
<td>Group</td>
<td>Click the magnifying glass icon, and then select a group from the list of groups. You can select only one group in this field.</td>
</tr>
<tr>
<td>Table</td>
<td>Select the appropriate database table, in this case Incident [incident].</td>
</tr>
<tr>
<td>Group field</td>
<td>Enter the field name from the Incident table that defines the group to notify. For example, you might send notification of the update to the designated assignment group by typing assignment_group.</td>
</tr>
<tr>
<td>Weight</td>
<td>Weight determines the sending priority of each notification when more than one qualifies. This is an arbitrary scale that you set.</td>
</tr>
<tr>
<td>Send to event creator</td>
<td>Select this check box to send the notification to the person who performed the action that started the notification process if the person is also specified in the Users/groups in fields, Users, or Groups field. If the event creator is not specified in one of these fields, the event creator does not receive a notification regardless of the setting in this field. For new notifications, this option is selected by default.</td>
</tr>
<tr>
<td>Type</td>
<td>Select EMAIL.</td>
</tr>
<tr>
<td>Active</td>
<td>Select the check box (true) to enable email notification.</td>
</tr>
<tr>
<td>Conditions</td>
<td>Updated --&gt; is anything. This creates the condition under which the notification is sent. In the example, an update to any field in an incident record sends an email to all recipients.</td>
</tr>
</tbody>
</table>
## Field | Input Value
--- | ---
**Subject** | Type an appropriate subject line for your email. Select variables for your content from fields in the Incident table. Put the cursor in the subject line where you want the variable to appear, and then click the field name in the Select variables column. For this exercise, type the following subject line and insert the variable for the Priority field:

An Incident of Priority `${priority}` has been updated.

In this notification, the variable `${priority}` returns the value 1 – Critical.

**Message** | Construct a message that includes all the information you think the recipients need to know about the updated incident. Select the appropriate variables for your message from the fields in the Incident table. Put the cursor in the message where you want the variable to appear, and then click the field name in the Select variables column. The special character, `<hr/>`, creates a manual break in the message that sets off the Comments section. For this example, create the following message:

Short Description:

`${short_description}`

Click here to view incident:

`${URI}`

Incident number: `${number}`

Category: `${category}`

Assigned to: `${assigned_to}`

Assignment group:

`${assignment_group}`

<hr/>

Comments:

`${comments}`

**List** | Click the lock icon to open a list of recipients for the email notification. Click the magnifying glass icon and select names from the list of users. You can select as many users from the list as you want.

**List field** | Enter the field name from the Incident table that identifies a list that contains potential recipients. For example, to send the notification to users who are on the watch list for this issue, type watch_list.
<table>
<thead>
<tr>
<th>Field</th>
<th>Input Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMS alternate</td>
<td>Enter an abbreviated version of the email message that eliminates such things as the ${URI} link that requires recipient interaction and the ${comments} field. SMS messages can only display 140 characters.</td>
</tr>
</tbody>
</table>

Your email notification record should look like this:

3. **Note**: After you have created the email notification record, set up a test in your environment to make sure the intended recipients get the proper notification.

Create users in your platform who have email addresses you can monitor, and then create a group that includes one of these users.
4. Open a Priority 1 – Critical incident, and assign it to one of the users you created. Then select the group you created as the assignment group.

5. Open your email notification record and specify the recipients.
   1. Select one of the users you created from the lookup list in the User field.
   2. Type assigned_to for the User field value.
   3. Type assignment_group for the Group field value.

6. Update your Priority 1 incident by adding comments, and then click Update.

7. Check the email accounts of the user to whom you assigned the incident and the user member of the assignment group.

The email that is sent should have the same structure as the following sample:

---

**Email templates**

Email templates enable administrators to create reusable content for the subject line and message body of email notifications.

Templates deliver consistent information on specific system activities and improve the efficiency of creating multiple email notifications for similar actions. If necessary, you can make minor changes on the fly to an email that uses a template by overriding the subject line and message body content in the notification form. A common practice is to define the message body in a template and create new subject lines for different types of recipients. There is no limit to the number of templates that you can create.

Email templates are created in rich HTML format, and administrators have the option of converting existing email templates to rich HTML (starting with the Eureka release). This format provides several advantages, including:

- Raw HTML content is converted into a WYSIWYG format.
- The content can be edited in a feature-rich HTML editor.
- Mail scripts are condensed into a single, easy-to-read line that can be reused in multiple email notifications.
- To prevent broken links, images linked using URLs relative to a particular instance are converted to absolute links.

**Create an email template**

You can create an email template with rich HTML formatting, rather than plain text.

Role required: admin

1. Navigate to System Policy Email Templates.
2. Click New.
3. Fill in the form fields (see table).
Figure 165: Email Template form with the HTML editor
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a unique name for the template. For example, change.update.risk.</td>
</tr>
<tr>
<td>Application</td>
<td>The type of scoped application.</td>
</tr>
<tr>
<td>Email layout</td>
<td>If the message body for the template is to be formatted using a predefined email layout, select the layout.</td>
</tr>
<tr>
<td>Table</td>
<td>Select the name of the table involved. For example, Change Request [change_request].</td>
</tr>
<tr>
<td>Subject</td>
<td>Enter a subject line that explains the purpose of the email. Select the appropriate variables for the subject line from the fields available on the selected table. Place the cursor where you want the variable to appear, and click the field name in the Select variables column. For example: <code>${sys_class_name} ${number} with ${risk} risk has been assigned to you.</code></td>
</tr>
<tr>
<td>Message HTML</td>
<td>Enter the content of the email template message. You can use the HTML editor toolbar to format the HTML, and you can include variables from the Select variables column. Variables map to column names available from the notification table, its parent tables, and reference tables. Use variables to include values from a record in the table such as an incident short description or comments and work notes. Notes: • When a template is applied to a notification, the contents of this field are used when you select HTML and plain text or HTML in the Content Type field in the Email Notification form. • You cannot use HTML code to control the appearance of the contents in the ${comments} variable. • If you want to include a link to the record that triggered the notification, see Enable links to records on page 680.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Message Text</td>
<td>Enter the notification message to send in plain text.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> When a template is applied to a notification, the contents of this field are used when you select HTML and plain text or Text in the Content Type field in the Email Notification form.</td>
</tr>
<tr>
<td>SMS alternate</td>
<td>Create a different message to be delivered to an SMS device. Enter a brief message, showing the most important information only. If this message field is blank, the contents of the Message Text field are used for the SMS message.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> The message in this field is used when the message is sent to a device configured as SMS.</td>
</tr>
</tbody>
</table>

**Apply a template to an email notification**

After you create an email template, you can apply it to a notification.

Role required: admin

1. Navigate to System Notification Email Notifications.
2. Open the email notification record that should use the template.
3. Navigate to the What it will contain section.
4. From the Email template field, select the appropriate template.
5. Click Update.

**Convert an email template to rich HTML**

If you have an email template created prior to the Eureka release, you can convert it to rich HTML.

Role required: admin

1. Navigate to System Policy Email Templates.
2. Open the email template you want to convert.
Subject: Your KB Submission ${number} was closed after one or more articles were created

Thank you for submitting ${number}. We appreciate your willingness to help out the knowledge management team. Your article led us to generate the following new knowledge base articles:

${mail_script:kb_submission_script_1}

The knowledge engineer had the following comments upon closure:

${close_notes}
3. Click Switch to Rich HTML Editor.

When content is converted, these changes are made to the content:

- **HTML Editor**: Any raw HTML in the Message field is rendered as WYSIWYG text in the Message HTML field. The content can be edited in a feature-rich HTML editor.
- **Simplified Mail Scripts**: Any mail scripts in the body are automatically saved to the Email Script [sys_script_email] table and are replaced in the notification body with an embedded script tag. This makes the template body easier to read and makes it easier to reuse scripts in multiple email templates.
Thank you for submitting $\text{number}$. We appreciate your willingness to help out the knowledge management team. Your article led us to generate the following new knowledge base articles:

$\text{mail_script:kb_submission_script_1}$

The knowledge engineer had the following comments upon closure:

$\text{close_notes}$
4. Modify the message text, as needed, using the WYSIWYG editor or by editing the underlying HTML.

Note: The letter "P" at the bottom of the screen shows the location of your cursor within the Message field. In this case, the cursor is in a line containing an `<HTML>` tag.

Note: Email templates that are already formatted with rich HTML do not show the Switch to Rich HTML Editor button.

Whether you are working with templates converted from earlier versions or creating new templates in the rich HTML format, it is a good practice to write mail scripts in System Notification Email Notification Email Scripts. When the scripts are completed, a `${mail_script:script name}` embedded script tag should be added to the email template body. This makes it easy to use the same scripts in multiple email templates. All that needs to be copied and pasted from one template to the next is the embedded script tag.

If you manually enter a mail script in the body of a new or converted email notification or template, and then attempt to save the record, a message asks whether the mail script should be converted. Unconverted mail scripts often fail to run from inside the HTML editor. If you select Yes, the script is added to the Email Script [sys_script_email] table and is automatically replaced in the body with an embedded script tag.

You can view the mail scripts in their original form by opening the email template and clicking the Show Notification Scripts related link.

Override a template value
You can customize an email notification to override a specific value without changing the basic information contained in the template.

Role required: admin

1. Navigate to System Policy Email Templates.
2. Open an email template.
3. Enter a new value for the field you want to override.
4. Click Update.

For example, you might change the subject line to read The risk level of `${sys_class_name} ${number}` has been raised to `${risk}`. This would not change the basic information about the change request contained in the template, but would make the email notification appropriate for the change manager who needs to know when risk levels are escalated above a certain threshold.

Construct an email message with a template
Email templates provide a list of the fields from database tables that are available for constructing an email message.

An email template can include a mailto automatic response link, which enables the email recipient to simply choose a link that sends a preformatted response back to the instance. An example is the email template used for notification that an approval is required. The following example shows the base email:
**Figure 166: Email notification with the template specified**

<table>
<thead>
<tr>
<th>When to send</th>
<th>Who will receive</th>
<th>What it will contain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content type</td>
<td>HTML and plain text</td>
<td>Importance: None</td>
</tr>
<tr>
<td>Include attachments</td>
<td>No</td>
<td>From:</td>
</tr>
<tr>
<td>Omit watermark</td>
<td>No</td>
<td>Reply to:</td>
</tr>
<tr>
<td>Push Message Only</td>
<td>No</td>
<td>Push Messages: Approval Request</td>
</tr>
<tr>
<td>Email template</td>
<td>change_billapprove role</td>
<td></td>
</tr>
<tr>
<td>Subject</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Message HTML</td>
<td></td>
<td>Select variables:</td>
</tr>
</tbody>
</table>
The selection list on the right shows the available fields from the sysapproval_approver table. All email templates used are based on an event that was created. Generally events are created based on business rules that execute when a database record is modified in some way. The database record being modified when the event is created is the record that is available for generating an email request.

In this case, a change request approval was requested, which results in an update to the sysapproval_approval table. The "approval events" business rule was executed, which created the "approval.inserted" event. The "Approval Request" email event is defined to process the approval.inserted event, and this email event is defined to use the following change.itil.approve.role email template. Notice that this template has two mailto: items specified. One for "mailto.approval" and one for "mailto.rejection." This email template builds an automatic response that lets the email receiver simply click a link in the email to either approve or reject the change request.

Here is what the change.itil.approve.role template looks like using the rich HTML editor:
Email Template

change.itl.approve.role

Name: change.itl.approve.role
Application: Global
Email layout: Unsubscribe and Preferences
Table: Approval [sysapproval.approver]
Subject: ${sysapproval.sys_class_name} ${sysapproval} Approval Request

Message HTML:

Short Description: ${sysapproval.short_description}
Priority: ${sysapproval.priority}
Category: ${sysapproval.category}

${mail_script:change_request_summary}
Comments:
${sysapproval.description}

${mailto:mailto.approval}

${mailto:mailto.rejection}

Click here to view Approval Request: ${URI}
Click here to view ${sysapproval.sys_class_name}: ${sysapproval.URI}

div
Notice the *change.iti.approve.role* template also uses a predefined email layout (Unsubscribe and Preferences), which provides links for the recipient to unsubscribe from approval notifications and set notification preferences.

And here is the *mailto.approval* template:

![Email Template](image)

**Figure 168: mailto approval template**

**Note:** If you put text on the lines following the Click here to approve `${sysapproval}` line, this text forms the actual body of the email.

The combination of templates used would generate an email similar to the following example:
Figure 169: Template generated email message

Notice that the email recipient can use the following links in the mail:

- A link to view all the details of the change request
- A link to view the approval record
- A link that generates an automatic email response to approve the change
- A link that generates an automatic email response to reject the change
- A link to unsubscribe from approval notifications and another link to set notification preferences

Add blank lines in an email template

You can easily add blank lines in an email template using HTML tags.

Judicious use of these HTML tags can make your email easier to read.

- You can use `<br/>` to insert a line break
- You can wrap paragraphs in `<p>` ... `</p>` tags to format your email nicely.

*Calendar integration*

With email notifications, you can use import export maps to leverage information about records and integrate with Outlook or another calendar.

For example, an email notification can create a calendar event based on the planned start and end dates of a change request. To enable integration with a calendar, the following iCalendar variables are available to be added to an email template message and reference the email template from the notification. The variables must be added to the Message Text field.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>${dtstart}</td>
<td>Start Date</td>
</tr>
<tr>
<td>${dtend}</td>
<td>End Date</td>
</tr>
<tr>
<td>${location}</td>
<td>Location</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>${alarm_time}</td>
<td>Alert or reminder time</td>
</tr>
</tbody>
</table>

The instance computes the value of iCalendar variables using import and export maps for the following tables:

- change_request
- reminder
- itil_appointment
- incident

Figure 170: Import export maps

Each import export map can specify a different set of iCalendar fields. For example, the icalendar.change_request import export map only maps two iCalendar fields.

Figure 171: iCalendar change request mappings

The instance uses the External Name value as the variable name in the email template. For example, the icalendar.change_request import export map defines the dtstart and dtend variables.

<table>
<thead>
<tr>
<th>External name</th>
<th>Associated variable name</th>
<th>Table</th>
<th>Field mapped</th>
<th>Field label</th>
</tr>
</thead>
<tbody>
<tr>
<td>dtstart</td>
<td>${dtstart}</td>
<td>change_request</td>
<td>start_date</td>
<td>Planned start date</td>
</tr>
</tbody>
</table>
Map date fields to iCalendar variables
You can specify what fields provide the date information in calendar invitation notifications by changing the field mappings of the dtstart and dtend variables in the import export map for the iCalendar invitation.

Role required: admin
1. In the navigation filter, enter sys_impex_map.list.
2. Open the icalendar.change_request map or the map you want to edit.
3. In the Field Maps related list, click either the end_date or start_date mapped field to change the mapping for dtstart or dtend, as needed.
4. Change the Database field to the field you want to use to set the start date or end date.
5. Click Update.

Create iCalendar invitations for custom tables
To generate iCalendar invitations that use field values from custom tables, create an import export map that computes the values of the iCalendar fields.

Role required: admin
1. Create the custom table and fields using the Date/Time field type for the fields that map to the ${dtstart} and ${dtend} variables.
2. In the navigation filter, enter sys_impex_map.list.
3. Click New.
4. Set the following fields:
   • Name: Use the following naming convention: icalendar.<table name>. For example, icalendar.u_my_custom_table.
   • Table: Select the custom table you created.
   • Type: Select icalendar.
5. Right-click the form header and select Save.
6. In the Field Maps related list, click New.
7. In the Mapping Entry Wizard, select Mapping to a Database Field.
8. Create field mappings for dtstart and dtend. These variables are required.
   For example, map the External Name dtstart to the u_meeting_start_time field in u_my_custom_table.
9. Click Submit.
10. Create field mappings for any other iCalendar fields as necessary.
11. Click Update.

Here are sample field mappings between iCalendar variables and custom fields in a custom table, u_my_custom_table:

<table>
<thead>
<tr>
<th>External name</th>
<th>Database field</th>
<th>Type</th>
<th>Map</th>
</tr>
</thead>
<tbody>
<tr>
<td>dtstart</td>
<td>u_meeting_start_time field</td>
<td>icalendar.u_my_custom_table</td>
<td></td>
</tr>
<tr>
<td>dtend</td>
<td>u_meeting_end_time field</td>
<td>icalendar.u_my_custom_table</td>
<td></td>
</tr>
</tbody>
</table>
Create an email template that defines what to include in the iCalendar invitation.

a) Set the Table field to the custom table you created.

b) In the Message text field, use the following format to define the iCalendar invitation.

```
BEGIN:VCALENDAR
PRODID:-//Service-now.com//Outlook 11.0 MIMEDIR//EN
VERSION:2.0
METHOD:REQUEST
BEGIN:VEVENT
ATTENDEE;ROLE=REQ-PARTICIPANT;RSVP=TRUE:MAILTO:${to}
DTSTART:${dtstart}
DTEND:${dtend}
UID:${sys_id}
DTSTAMP:${dtstamp}
DESCRIPTION:${description}
SUMMARY:${u_meeting_summary}
END:VEVENT
END:VCALENDAR
```

Note: Mail script is not allowed or processed in meeting invitation email templates.

### Table 129: iCalendar invitation template details

<table>
<thead>
<tr>
<th>iCalendar template line</th>
<th>Required?</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEGIN:VCALENDAR</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>PRODID:-//Service-now.com//Outlook 11.0 MIMEDIR//EN</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>VERSION:2.0</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>METHOD:REQUEST</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>BEGIN:VEVENT</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>ATTENDEE;ROLE=REQ-PARTICIPANT;RSVP=TRUE:MAILTO:${to}</td>
<td>Yes</td>
<td>You must use the import export map to map dtstart to a start time field on the custom table.</td>
</tr>
<tr>
<td>DTSTART:${dtstart}</td>
<td>Yes</td>
<td>You must use the import export map to map dtstart to a start time field on the custom table.</td>
</tr>
<tr>
<td>DTEND:${dtend}</td>
<td>Yes</td>
<td>You must use the import export map to map dtend to an end time field on the custom table.</td>
</tr>
<tr>
<td>iCalendar template line</td>
<td>Required?</td>
<td>Notes</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-----------</td>
<td>-------</td>
</tr>
<tr>
<td>UID:${sys_id}</td>
<td>Yes</td>
<td>You must provide the name of a field that uniquely identifies the record, such as the sys_id or the record number field.</td>
</tr>
<tr>
<td>DTSTAMP:${dtstamp}</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>DESCRIPTION: ${{description}}</td>
<td>No</td>
<td>To include a multiple line description, you must use the import export map to map description to a text field on the custom table. The field mapping ensures that the system encodes line breaks correctly for the iCalendar file format.</td>
</tr>
<tr>
<td>SUMMARY: ${{u_meeting_summary}}</td>
<td>No</td>
<td>To include a summary from a text field on the custom table, provide the name of the field, such as u_meeting_summary. The summary field value must not contain line breaks. You do not need to create a field mapping.</td>
</tr>
<tr>
<td>END:VEVENT</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>END:VCALENDAR</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

13. Create an email notification to trigger the iCalendar invitation and ensure the following fields are set accordingly:
   - Table: Select the custom table.
   - Type: Select Meeting Invitation.
   - Content type: Select Plain text only.
   - Email template: Select the template you created.

Email layouts
Create reusable content for the message body of email templates.
Administrators can use email layouts to:

- Ensure all email notifications have a consistent layout such as always displaying a header, body, and footer.
- Display static content on all email notifications such as a company logo or a background.
- Declare inline styles available for use in the message body of an email template such as setting a text font, size, and color.
- Provide users with links to common response actions such as unsubscribe from a notification or manage notification preferences.
Email layouts insert HTML elements into the message body of email templates. Any style elements you define in the email layout are available to the email template. Email layouts support style sheets in these formats.

- Internal style sheets defined within a `<style>` element.
- Inline styles within a style attribute.

By default, the system includes several sample layouts administrators can use to create their own layouts. Administrators can create email layouts using an inline HTML editor or manually entering HTML code. The system stores email layout records in the Email Layout [sys_email_layout] table.

**Create an email layout**

Create an email layout to specify the HTML content you want to appear in the body of one or more email templates.

- Role required: admin
- Record required: email template record

1. Navigate to System Policy Email Layouts.
   The system displays the list of existing email layouts.
2. Click New.
   The system displays a blank email layout form.
3. Fill in the form.

### Table 130: Email layout fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Specify a unique name for the record.</td>
</tr>
<tr>
<td>Application</td>
<td>Lists the parent application to which this record belongs.</td>
</tr>
<tr>
<td>Description</td>
<td>Specify an optional description of the layout.</td>
</tr>
<tr>
<td>Advanced</td>
<td>Select whether to display the Advanced Layout field.</td>
</tr>
</tbody>
</table>
| Layout      | Use the inline editor to add HTML elements. The system displays HTML from this field in the body of any email template that uses the layout. Include notification variables to show content from the related record. For more information notification variables see [Notification variables](#) on page 676. Note: The editor automatically formats any HTML code you enter from the Source code view.
Field | Description
--- | ---
Advanced Layout | Use this field to manually enter HTML code. The system displays HTML from this field in the body of any email template that uses the layout.

Note: Click here to disable syntax highlighting and script formatting to enter text in this field.

4. Click Submit. The system creates the email layout record.
5. Navigate to System Policy Email Templates. The system displays the list of existing email templates.
6. Select the email template which you want to use an email layout. The system displays the email template record.
7. In Email layout, select the email layout you want to use to format the body of email messages.
8. Click Update. The email template uses the selected email layout to format the body of email messages.

Inbound email actions

Inbound email actions enable you to define the actions an instance takes when receiving email.

Inbound email actions are similar to business rules: both use conditions and scripts that take action on a target table. An inbound email action checks the email for a watermark that associates it with a task and checks for other conditions. If the conditions are met, the system takes the inbound email action that you configure. The system can take two types of actions:

- Record action: setting a value for a field in the target table.
- Email reply: sending an email back to the source that triggered the action.

By default, if an email has no identifiable watermark, an inbound email action attempts to create an incident from the message. If the email has a watermark of an existing incident, an inbound email action updates the existing incident according to the action’s script.

The following video explains the actions that the instance can take in response to messages from users and shows how to create or modify inbound email actions.

**Inbound email action types**

The system classifies all incoming email into one of three types: forward, reply, or new.
<table>
<thead>
<tr>
<th>Order</th>
<th>Type</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Forward</td>
<td>The system classifies an email as a forward only when it meets all these criteria:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The <em>subject line</em> contains a recognized forward prefix such as FW:.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The <em>email body</em> contains a recognized forward string such as From:.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The system classifies any email that meets these criteria as a forward, even if the message contains a watermark or record number that otherwise classifies it as a reply.</td>
</tr>
<tr>
<td>2</td>
<td>Reply</td>
<td>The system classifies an email as a reply when it fails to match it to the forward inbound action type and it meets any one of these criteria:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The subject line or email body contains a recognized watermark such as Ref:MSG0000008.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- There is no watermark and the <em>Reply-To header</em> contains a recognized record number such as INC0005574.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- There is no watermark and the subject line contains a recognized reply prefix such as RE: and a recognized record number such as INC0005574.</td>
</tr>
<tr>
<td>3</td>
<td>New</td>
<td>The system classifies an email as new when it fails to match it to the forward and reply inbound action types.</td>
</tr>
</tbody>
</table>
Figure 173: Determining the type of incoming email
Attachments

If an inbound email contains one or more email attachments, the inbound email action adds the attachments to the first record the action produces.

Character encoding

- If the email encoding is ASCII-7 or UTF-8, inbound email actions preserve the character encoding in any associated task records they produce.
- If the email encoding is ISO-8859-1, the inbound email action attempts to convert the email to Windows 1252.
- Inbound email actions convert any other encodings (for example, Mac OS Roman) to plain text, which may or may not be readable.

See the Email logs for examples of what you might see if a notification or inbound email action is not processed.

Note: The state of all incoming emails that have been run against inbound email actions, even if there is no matching action, is changed to Processed.

Domain separation

The system ignores the domain that the inbound email action record is in when it creates a record based on the inbound email action. Keep inbound actions in the global domain. For example, if your inbound email action creates an incident, the system creates the incident in the same domain as the user in the Caller field. If that user is not in the User [sys_user] table, the incident is in the global domain.

Inbound email processing

The system determines which inbound actions to run by comparing the inbound email type and inbound action conditions to the incoming email message. Certain properties are available to set the reply and forwarding prefixes in the email subject lines that your instance recognizes when processing inbound emails.

The system follows this processing flow to determine whether to run an inbound action.
Figure 174: Inbound action processing work flow

The system only runs an inbound action when:

- The incoming email type matches the inbound action Type.
- If present, the watermark or record number refers to a record in the Target table.
• The inbound action Conditions evaluates to true.

If any of these criteria are not met, the system skips the current inbound action and evaluates the next active inbound action. The system processes inbound actions from the lowest to highest Order value. If the inbound action has Stop processing enabled, the system updates the State of the email record to Processed after running the inbound action Script.

The following video shows how an inbound action condition prevents an incident from being created.

Prefixes recognized in email subject lines

Email reply prefixes

When no watermark is present or the In-Reply-To email header is present, the instance recognizes email containing a prefix from the glide.email.reply_subject_prefix property as reply email. You can use this property to set non-standard reply prefixes in your email system.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.email.reply_subject_prefix</td>
<td>Specifies the list of prefixes (comma-separated) in the subject line that identify an email reply.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: re:, aw:, r:</td>
</tr>
<tr>
<td></td>
<td>• Location: Add to the System Properties [sys_properties] table</td>
</tr>
</tbody>
</table>

Note: Prefixes are case insensitive.

Email forward prefixes

Emails with certain prefixes trigger the forward type of inbound email action. The instance recognizes any email whose subject line contains a prefix from the glide.email.reply_subject_prefix property as forwarded email. Emails with these prefixes trigger inbound email actions of the type forward. Use this property to set non-standard forward prefixes in your email system or you want email forwards to behave like replies.
### Email forwards as replies

Properties are available to force inbound actions to process forwarded mail as replied mail. These properties control the subject prefix that the inbound actions use.

<table>
<thead>
<tr>
<th>Property</th>
<th>Value needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.email.reply_subject_prefix</td>
<td>re:, Re:, aw:, r:, fw:, Fwd:, FWD:</td>
</tr>
<tr>
<td>glide.email.forward_subject_prefix</td>
<td>[any text that is not a forward prefix]</td>
</tr>
</tbody>
</table>

These properties cause the Update Incident inbound action to process all forwarded and replied-to mail.

**Note:** The `glide.email.forward_subject_prefix` property must contain some text so that the forwarded email can be processed as a Reply. It can be any text except a forward prefix (that is, fw:, fwd:, Fwd:, FWD:).

### Matching a sender email address to a user

The instance matches a senders email address to an active user in the User [sys_user] table using inbound actions.

**Note:** The Email Automatic User Creation plugin must be active.
When processing an email, the instance sets the current user to the user whose email address matches `email.from`. Inbound actions can then reference that current user. For example, the base system inbound action `Create Incident` sets the `caller_id` of the incident to the value returned by `gs.getUserID()`.

If multiple users have the same email address, the instance first searches for an active user with the email address. The instance does not match inactive users.

**Note:** Each user record must have a unique email address so that the instance can reliably match the email to the correct user.

If a unique email address for each user is not possible, assign a shared email address to only one active user so that the instance always matches incoming email from that address to the active user.

**Matching watermarks in the Subject line or Body**

The following examples illustrate how the instance matches randomized watermarks in an email subject line or body.

**Note:** For instances upgraded from a release before Jakarta, the system can recognize both randomized and non-randomized watermarks during a watermark transition period. For details, see the *Notifications upgrade information*.

<table>
<thead>
<tr>
<th>Subject Line or Body Contents</th>
<th>Matching Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ref:MSG0000008_aLjc130zDhCVuh3spXmt</td>
<td>The instance recognizes this string as a watermark and searches the Email Watermarks [sys_watermark] table for a record with the number MSG0000008_aLjc130zDhCVuh3spXmt. If this watermark exists, the instance matches the email to the associated record. If this watermark does not exist, the system processes inbound email messages as described in <em>Criteria for matching email to inbound actions</em> on page 741.</td>
</tr>
<tr>
<td>Ref:MSGWTR0000008_wfLLz42IxCgUvG2JlYnh</td>
<td>The instance recognizes this string as a watermark and searches the Email Watermarks [sys_watermark] table for a record with the number MSGWTR0000008_wfLLz42IxCgUvG2JlYnh. If this watermark exists, the instance matches the email to the associated record. If this watermark does not exist, the system processes inbound email messages as described in <em>Criteria for matching email to inbound actions</em> on page 741.</td>
</tr>
</tbody>
</table>

**Matching record numbers in the Subject line or Body**

The following examples illustrate how the instance matches record numbers in the subject line of an email to an existing record when no watermark is present.
### Table 133: Examples of matching record numbers in the Subject line

<table>
<thead>
<tr>
<th>Subject line contents</th>
<th>Matching results</th>
</tr>
</thead>
<tbody>
<tr>
<td>RE: Example INC0005574</td>
<td>The instance recognizes this subject line as a reply and recognizes the INC prefix as belonging to the Incident table. The instance searches the Incident table for an existing record INC0005574. If this incident exists, the email is associated with this incident. If this incident record does not exist, the instance uses the inbound action for new emails to create an incident and associates the new incident with the email.</td>
</tr>
<tr>
<td>RE: Example &quot;INC0005574&quot;</td>
<td>The instance recognizes this subject line as a reply but does not recognize the &quot;INC prefix as belonging to the Incident table because of the quotation mark. The same error occurs for any character other than a space before the record number. The instance instead uses the inbound action for new emails to create an incident and associates the new incident with the email.</td>
</tr>
<tr>
<td>RE: Example *INC0005574</td>
<td>The instance recognizes this subject line as a reply and recognizes the INC prefix as belonging to the Incident table. The instance searches the Incident table for an existing record INC0005574&quot;, which it cannot find because of the quotation mark. The same error occurs for any character other than a space at the end of the record number. The instance instead uses the inbound action for new emails to create an incident and associates the new incident with the email.</td>
</tr>
<tr>
<td>RE: CHG0008593 and INC000576</td>
<td>The instance recognizes this subject line as a reply and recognizes one, but not both, of the number prefixes. There is no way to predict which prefix the instance matches first. Whichever prefix it matches, it searches the corresponding table for a matching record. If the record exists, the email is associated with the table. If the record does not exist, the instance uses the inbound action for new emails to create an incident and associates the new incident with the email.</td>
</tr>
</tbody>
</table>

**Note:** The instance does not support processing email with multiple numbers in the subject line because there is no way to predict which record the instance matches first. For this reason, do not include more than one $number variable in your notifications.
<table>
<thead>
<tr>
<th>Subject line contents</th>
<th>Matching results</th>
</tr>
</thead>
<tbody>
<tr>
<td>FW: Example INC0005574</td>
<td>The instance recognizes this subject line as a forward because of the FW: prefix. It uses the inbound action for forwarded emails to create an incident and associates the new incident with the email.</td>
</tr>
<tr>
<td>Example INC0005574</td>
<td>The instance recognizes this subject as a new email because it does not contain a matching reply or forward prefix. It uses the inbound action for new emails to create an incident and associates the new incident with the email.</td>
</tr>
</tbody>
</table>

Criteria for matching email to inbound actions

The system matches incoming email to the conditions of the active inbound actions.

The default inbound actions create or update task record under these conditions.
Figure 175: Default matching criteria

If you customize or deactivate the default inbound actions, the system checks the conditions of the active inbound actions. If the system cannot find an inbound action with matching conditions, it sets the state to Processed.
Figure 176: Custom matching criteria
### Table 134: Inbound action type criteria

<table>
<thead>
<tr>
<th>Inbound email action type</th>
<th>Required matching criteria</th>
<th>Name of default action (Incident table)</th>
<th>Result of default action</th>
</tr>
</thead>
</table>
| Forward                   | The email contains the following conditions:  
  1. A subject starting with a recognized forward prefix (even if a watermark or an In-Reply-To header is present).  
  2. From <user email> appears anywhere in the email body. | Create Incident (Forwarded) | Create new record |
| Reply                     | The email contains one of the following conditions and the table specified in the email matches the table of the inbound action:  
  1. A valid watermark that matches an existing record.  
  2. An In-Reply-To email header (when no watermark is present) that matches an existing record.  
  3. A subject line starting with a recognized reply prefix (when neither a watermark nor an In-Reply-To header is present) and a valid record number that matches an existing record. | Update Incident (BP) | Update existing record |
Inbound email action type | Required matching criteria | Name of default action (Incident table) | Result of default action
--- | --- | --- | ---
New | The email does not meet the conditions for either a reply or forward type inbound email action | Create Incident | Create new record

If more than one inbound action is available for a particular type, the instance uses the Table field to match the email to a particular table. If there is also more than one action for the inbound action's table, the instance uses the Order field to determine the order in which the actions run.

Create an inbound email action
You can create inbound email actions to define the actions that the system takes when an email is received.

Role required: admin

1. Navigate to System Policy Email Inbound Actions.
2. Click New.
3. Fill in the fields as described in the table.
Inbound email actions specify how ServiceNow creates or updates task records in a table when the instance receives an email. The inbound email action looks for a watermark in the email to associate it with a specific task. If the conditions specified in the inbound action are met, the script is run.

**Inbound Email Actions - Create Incident**

<table>
<thead>
<tr>
<th>Name</th>
<th>Create Incident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target table</td>
<td>Incident [Incident]</td>
</tr>
<tr>
<td>Action type</td>
<td>Record Action</td>
</tr>
<tr>
<td>Application</td>
<td>Global</td>
</tr>
</tbody>
</table>

**When to run**

**Actions**

Only emails of the selected **Type** will trigger this inbound action. Only emails from senders with the **Required roles** will trigger this inbound action.

<table>
<thead>
<tr>
<th>Type</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required roles</td>
<td></td>
</tr>
</tbody>
</table>

Order determines when to run relative to other inbound actions. The inbound action with the lowest order runs first.

<table>
<thead>
<tr>
<th>Order</th>
<th>100</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>From</th>
<th></th>
</tr>
</thead>
</table>

All of the following conditions must be true, to trigger this inbound action.

**Conditions**

---

---

---
Note: You might need to configure the form to see all fields.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>When to run</td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Enter a descriptive name for this email action.</td>
</tr>
<tr>
<td>Target table</td>
<td>Select the table where the action adds or updates records.</td>
</tr>
<tr>
<td>Action type</td>
<td>Select the type of action the instance takes. Select Record Action to modify a record in the instance, or select Reply Email to have the instance send an email back to the source of the inbound email.</td>
</tr>
<tr>
<td>Active</td>
<td>Select this check box to prevent the system from running additional inbound email actions after this action runs. Clear the check box to disable the action.</td>
</tr>
<tr>
<td>Stop processing</td>
<td>Select this option to stop processing after this inbound email action runs.</td>
</tr>
<tr>
<td>Type</td>
<td>Select the message type required to run the action. The action runs only if the inbound email is of the selected type. Available types are:</td>
</tr>
<tr>
<td></td>
<td>• New: An email that is not recognized as a reply or forward.</td>
</tr>
<tr>
<td></td>
<td>• Reply: An email with a watermark with an In-Reply-To email header, or whose subject line begins with a recognized reply prefix.</td>
</tr>
<tr>
<td></td>
<td>• Forward: An email whose subject line begins with a recognized forward prefix, even if the email also contains a watermark or In-Reply-To header.</td>
</tr>
<tr>
<td>Required roles</td>
<td>Specify required roles the sender must have to trigger the inbound action.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Order</td>
<td>Enter a number that specifies when this inbound action runs relative to other inbound actions that use the same target table. The instance processes the action with the lowest order number first.</td>
</tr>
<tr>
<td>From</td>
<td>Select the user required to run the action. If a user is selected, the action runs only when the email sender matches the user name. Leave this field blank to perform the action for all users.</td>
</tr>
</tbody>
</table>
| Condition     | Specify the condition that must evaluate to true to trigger the inbound action. Build a condition with the choice lists or enter a statement that determines when the inbound email action runs. For example:  

```javascript
email.subject. startsWith ( "chg:" )
```

<table>
<thead>
<tr>
<th>Actions</th>
<th></th>
</tr>
</thead>
</table>
| Field actions | This field appears if the Action type is Record Action. Specify how information in the email is inserted into the record.  

For example, select [Created by] [From email] [Sender], so that when the request is inserted, you can see who it is for. |
<p>| Reply email   | This field appears if the Action type is Reply Email. compose the email message to send to the source that triggered the inbound email action. |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Script</td>
<td>Enter the script the action runs. Typically, this script uses the validators script include and email variables. A template is provided:</td>
</tr>
<tr>
<td></td>
<td>(function runAction(/ <em>GlideRecord</em>/ current, / <em>GlideRecord</em>/ event, / <em>EmailWrapper</em>/ email, / <em>ScopedEmailLogger</em>/ logger) { // Implement email action here }) (current, event, email, logger);</td>
</tr>
<tr>
<td></td>
<td>The following objects are available:</td>
</tr>
<tr>
<td></td>
<td>• current: access the record referred to by the inbound email. For example, current.assigned_to accesses the person assigned to the task.</td>
</tr>
<tr>
<td></td>
<td>• event: access one of the parameters of the originating event. For example, event.parm1 accesses the first parameter of the event or event.parm2 for the second parameter. See Events for more information.</td>
</tr>
<tr>
<td></td>
<td>• email: access the inbound current email record. For example, email.subject accesses the content in the subject line of the email. See Accessing email object variables on page 749 for more information.</td>
</tr>
<tr>
<td></td>
<td>• logger: add a message to the log file with the source set to email.&lt;Sys ID of incoming email&gt;. For example: logger.log (&quot;Some information&quot;)</td>
</tr>
<tr>
<td>Description</td>
<td>Enter a detailed explanation of what this inbound email action does.</td>
</tr>
<tr>
<td>Other fields</td>
<td>Order: Enter a number to define the order in which this email action should be processed. Actions with lower numbers are processed first. The Ordered Email Processing plugin does not install this field.</td>
</tr>
</tbody>
</table>

Accessing email object variables

An inbound email action script contains the email object to access various pieces of an inbound email through variables. You can use the global variable sys_email with inbound email actions.
Table 136: Accessing email objects with variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>email.to</td>
<td>Contains a comma-separated list of email addresses in the To: and Cc: boxes.</td>
</tr>
<tr>
<td>email.direct</td>
<td>Contains a comma-separated list of email addresses in the To: box.</td>
</tr>
<tr>
<td>email.copied</td>
<td>Contains a comma-separated list of email addresses in the Cc: box.</td>
</tr>
<tr>
<td>email.body_text</td>
<td>Contains the body of the email as a plain text string.</td>
</tr>
<tr>
<td>email.body_html</td>
<td>Contains the body of the email as an HTML string.</td>
</tr>
<tr>
<td>email.from</td>
<td>Contains an email address that depends on the following conditions:</td>
</tr>
<tr>
<td></td>
<td>• If the address listed in the email Headers field matches an existing user's Email address, this variable contains the user's email address.</td>
</tr>
<tr>
<td></td>
<td>• If the address listed in the email Headers field does not match an existing user's Email address, this variable contains the address listed in the email Headers field.</td>
</tr>
<tr>
<td>email.from_sys_id</td>
<td>Contains the Sys ID of the user who sent the email to the instance.</td>
</tr>
<tr>
<td>email.origemail</td>
<td>Contains the address of the email sender as listed in the email Headers field.</td>
</tr>
<tr>
<td>email.subject</td>
<td>Contains the subject of the email as a plain text string.</td>
</tr>
<tr>
<td>email.recipients</td>
<td>Contains a comma-separated list of recipient addresses as a plain text string.</td>
</tr>
<tr>
<td>email.recipients_array</td>
<td>Contains the recipient addresses as an array.</td>
</tr>
<tr>
<td>email.content_type</td>
<td>Contains the MIME content type of the email (for example, text/plain; charset=&quot;us-ascii&quot; or text/html; charset=&quot;us-ascii&quot;).</td>
</tr>
<tr>
<td>email.headers</td>
<td>Contains details about the sender, route, and receiver as a plain text string in the format of the sending email client.</td>
</tr>
</tbody>
</table>

**Note:** The instance follows [RFC 2822](https://tools.ietf.org/html/rfc2822) (Internet Message Format), which requires multiple email addresses in a group to be separated by commas, not semicolons. The instance can set the values of the email.to, email.direct, and email.copied variables only if emails addressed to groups follow the expected RFC format.
Inbound email.recipient variables

The recipients variables (email.recipients, email.recipients-array) allow processing of inbound email based on the email recipients. For example, you can create a script to process email based on the array values:

```javascript
var rarray = email.recipients_array; for (var i = 0; i < rarray.length; i++) {
    var recipient = rarray[i]; // do something with it
}
```

The sys_email variable

This variable lets you access the received sys_email record that triggered the inbound email action. It can be used to reference fields on the email record, such as uid, sys_id, content_type, and so on.

Email user matching

When the instance receives an email message, the system searches for an existing user record with the same email address as the sender.

**Table 137: Matching email to existing users**

<table>
<thead>
<tr>
<th>Value of email.from Variable</th>
<th>Matching User ID</th>
<th>Email Address</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="mailto:michael.tossi@company.com">michael.tossi@company.com</a></td>
<td><a href="mailto:michael.tossi@company.com">michael.tossi@company.com</a></td>
<td><a href="mailto:michael.tossi@company.com">michael.tossi@company.com</a></td>
<td>Michael Tossi</td>
</tr>
<tr>
<td>&quot;Michael Tossi&quot; <a href="mailto:michael.tossi@company.com">michael.tossi@company.com</a></td>
<td><a href="mailto:michael.tossi@company.com">michael.tossi@company.com</a></td>
<td><a href="mailto:michael.tossi@company.com">michael.tossi@company.com</a></td>
<td>Michael Tossi</td>
</tr>
<tr>
<td>&quot;Tossi, Michael&quot; <a href="mailto:michael.tossi@company.com">michael.tossi@company.com</a></td>
<td><a href="mailto:michael.tossi@company.com">michael.tossi@company.com</a></td>
<td><a href="mailto:michael.tossi@company.com">michael.tossi@company.com</a></td>
<td>Michael Tossi</td>
</tr>
<tr>
<td>&quot;Tossi&quot; <a href="mailto:mtossi@company.com">mtossi@company.com</a></td>
<td><a href="mailto:mtossi@company.com">mtossi@company.com</a></td>
<td><a href="mailto:mtossi@company.com">mtossi@company.com</a></td>
<td>Tossi</td>
</tr>
</tbody>
</table>

**Note:** This functionality requires that you activate the Email Automatic User Creation plugin.

Inbound Email Action scripts no longer support the gs.createUser() method. Use either the automatically-generated email variables or the gs.getUserID() method instead.

User impersonations and inbound actions

When the instance receives an email, it can take a variety of actions by impersonating the sender.

If the sender of an incoming email matches an existing user, the instance impersonates the matching user to complete any inbound email actions. If the sender does not match an existing user, the instance impersonates the Guest user to complete any inbound email actions. If the impersonated user is locked out, the inbound email action fails.

**Note:** If inbound email comes from an untrusted domain, the instance impersonates the Guest user unless you explicitly prevent users from untrusted domains from triggering inbound actions.

Enable automatic user creation

An administrator can set an email property to automatically create users from incoming email. The administrator provides a list of trusted domains to prevent untrusted users from being automatically created.

Role required: admin
For example, you can prevent email from users outside your company domain from creating incidents. When an instance receives a message and there is no matching email address from the sender, the instance can create a user with the User ID [sys_user.user_name] set to the sender's full email address. Users in your instance must still have write and update access to the records that they create or update through inbound email actions.

Table 138: Creating users from incoming email

<table>
<thead>
<tr>
<th>Value of email.from Variable</th>
<th>User ID Created</th>
<th>Email Address</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="mailto:new.user@company.com">new.user@company.com</a></td>
<td><a href="mailto:new.user@company.com">new.user@company.com</a></td>
<td><a href="mailto:new.user@company.com">new.user@company.com</a></td>
<td>New User</td>
</tr>
<tr>
<td>&quot;New User&quot;<a href="mailto:new.user@company.com">new.user@company.com</a></td>
<td><a href="mailto:new.user@company.com">new.user@company.com</a></td>
<td><a href="mailto:new.user@company.com">new.user@company.com</a></td>
<td>New User</td>
</tr>
<tr>
<td>&quot;User, New&quot;<a href="mailto:new.user@company.com">new.user@company.com</a></td>
<td><a href="mailto:new.user@company.com">new.user@company.com</a></td>
<td><a href="mailto:new.user@company.com">new.user@company.com</a></td>
<td>New User</td>
</tr>
<tr>
<td>&quot;User&quot;<a href="mailto:nuser@company.com">nuser@company.com</a></td>
<td><a href="mailto:nuser@company.com">nuser@company.com</a></td>
<td><a href="mailto:nuser@company.com">nuser@company.com</a></td>
<td>User</td>
</tr>
</tbody>
</table>

1. Navigate to System Properties Email Properties.
2. Select the check box for Automatically create users for incoming email from trusted domains (glide.pop3readerjob.create_caller).

**Automatically create users for incoming emails from trusted domains**

Yes | No

**glide.pop3readerjob.create_caller**

3. Enter the list of trusted domains in Trusted domains for creating users from incoming emails (glide.user.trusted_domain).

```
trusted domains for creating users from incoming emails. Comma separated (e.g., "company.com,company.org,company.net"). Use * for all. Incoming email from other domains is ignored unless from an existing user’s address.

* glide.user.trusted_domain
```

**Note:** The glide.user.trusted_domain property only prevents user creation if the sender is not from a trusted domain. The system processes the inbound actions of the email as a guest user. If you want the system to ignore these email messages, use the **email filters** plugin, specifically the "ignore sender" setting. You can also prevent untrusted users from triggering inbound actions by locking out the guest user.

4. Click Save.
5. Complete the following steps to lock out the guest user.
   a) Navigate to User Administration Users and select the user guest.
   b) Select the Locked out field to disable the guest account.
When the property glide.pop3readerjob.create_caller is set to false, the instance runs inbound actions from users who do not match an existing user by impersonating the guest user.

If the property glide.pop3readerjob.create_caller is set to true, but a user has a valid email address associated with a non-primary device, the instance creates a new user record for that email address if there is no matching email address in the Users [sys_user] table. The instance does not validate non-primary email addresses against the Notification Devices [cmn_notif_device] table.

The method the instance uses to create users can be upgraded to use the full email address by activating the Email Automatic User Creation plugin.

The plugin makes the following changes:

- Sets the property glide.email.create_userid_from_email to true.
- Increases the width of the User ID [sys_user.user_name] column to accommodate email addresses.

After activating the plugin, enable automatic user creation from email.

**Warning:** Review your existing user records to reconcile any that contain identical email addresses. If you activate the plugin prior to reconciling email addresses, your instance cannot distinguish between users with identical email addresses and randomly selects one of the users with the matching email address.

Allowing locked out users to request a password reset

A property is available to allow locked out users to trigger inbound actions. It is used by locked out users who need to reset their password to send email to the instance to ask for assistance.

### Table 139: Property allowing locked out users to trigger inbound email actions

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.pop3.process_locked_out</td>
<td>Enables (true) or disables (false) the ability for locked out users to trigger inbound actions.</td>
</tr>
<tr>
<td></td>
<td>- Type: true</td>
</tr>
<tr>
<td></td>
<td>- Default value: false</td>
</tr>
<tr>
<td></td>
<td>- System Properties [sys_properties] table</td>
</tr>
</tbody>
</table>

**Warning:** Enabling this property (glide.pop3.process_locked_out) also enables users from untrusted domains to trigger inbound actions.

Redirecting email to the instance POP3 account

Configure other mailboxes to forward email to the instance's POP3 account.

By default, the POP Reader scheduled job checks for new email every two minutes. It connects to the mail server and account specified in email properties. The POP Reader downloads any email waiting on the mail server and creates email.read events. After the instance processes the events, the inbound email actions run.

The POP Reader shows the number of emails processed during the reader's last run. The message shows the number of emails the reader processed or 0 processed if no emails were available. The reader resets the status each time it runs.

While it is not possible to specify more than one POP3 account for the instance, you can forward other mailboxes to the designated POP3 account. This script can be added to the Create Incident inbound email action to differentiate the content based on the original recipient, and then set an assignment_group value.

```python
if(email.direct.indexOf('facilities@anycorp.com')>-1)
```
current.assignment_group.setDisplayValue('Facilities Management');

Setting field values from the email body

Values in an inbound email can set field values in a task record.

Any name:value pair in an inbound email body gets parsed into a variable/value pair in the inbound email script. The name:value pair must be on its own line. Note that most email clients limit the number of characters allowed per line and may truncate excessively long name:value pairs.

To populate a reference field, use setDisplayValue() instead. See Redirecting Emails for an example of using setDisplayValue() in an inbound email action.

**Note:** The action always generates a lowercase variable name. Also, this functionality does not work on reference fields.

For example, if an email body contains this line:

Foo:bar

The inbound email script creates the variable email.body.foo with the value of bar. You can use these variables to create conditions such as:

```javascript
if(email.body.foo!=undefined){
    current.[field]=email.body.foo;
}
```

In this example, the script sets the value of [field] to the value bar.

Integrate inbound events

This example illustrates how to create a notification from an inbound JSON request.

Role required: admin

When complete, you will be able to:

- Send a JSON request to the [imp_notification] web service import set with the JSON processor
- Create a new import set in the [imp_notification] table in the instance using data from the JSON request

The following example steps assume you have your own demonstration instance.

1. Activate the JSON Web Service plugin.
2. Install the RESTClient Firefox plugin.
3. Open the RESTClient.
4. Create the following JSON request.
   - Method: POST
   - URL: http://<instance name>.service-now.com/imp_notification.do?JSON
   - Headers: Authorization: Basic
   - Body:

```json
{"sysparm_action":"insert","message":"this is an event","uuid":"abc"}
```
5. Click Send.


7. Verify that the instance sends back a response with a sys_id.

8. Login to your development instance.


10. Verify that the import set table has an event matching your JSON request.
Inbound email action examples

Various examples of inbound email actions are available to help you build your own inbound email actions. These examples show how to set up inbound email actions to handle email replies, create (log) a problem record, request a change, and update an incident.

Inbound email action example: handling email replies

This example shows you how to set up inbound email actions to handle replies that users send back to the instance.

Role required: admin

The inbound email action parses the email and responds using a script. By default, an email received by the instance creates a new incident, and the body of the email is added to the Additional Comments text box. More refined Inbound Email Actions can create incident tickets with more data, thus saving the incident management team valuable time.

Normally, when a user responds to an email sent by the instance, the inbound email action matches the watermark to an existing incident, and updates the incident rather than creating a new record. However, if the watermark is missing, this inbound email action attempts to match a reply to the original incident.

1. Navigate to System Policy Inbound Actions and click New.
2. Populate the form as follows:

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Update Incident</td>
</tr>
<tr>
<td>Type</td>
<td>Reply</td>
</tr>
<tr>
<td>Target table</td>
<td>Incident [incident]</td>
</tr>
</tbody>
</table>

3. In Script, enter this code.

```javascript
gs.include('validators');

//Note: current.caller_id and current.opened_by are already set to the first UserID that matches the From: email address

if (current.getTableName() == "incident") {
    current.comments = "reply from: " + email.origemail + "\n\n" + email.body_text;

    if (email.body.assign != undefined)
        current.assigned_to = email.body.assign;

    if (email.body.priority != undefined && isNumeric(email.body.priority))
        current.priority = email.body.priority;
```
if (email.body.category != undefined)
    current.category = email.body.category;

if (email.body.short_description != undefined)
    current.short_description = email.body.short_description;

    current.update();
}

Inbound email action example: logging a problem
This example shows you how to set up inbound email actions to create a problem record.

Role required: admin

Inbound email actions allow users to log or update incidents on an instance via email. The inbound email action parses the email and responds using a script.

1. Navigate to System Policy Inbound Actions and click New.
2. Populate the form as follows:

<table>
<thead>
<tr>
<th>Field</th>
<th>Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Log Problem</td>
</tr>
<tr>
<td>Type</td>
<td>New</td>
</tr>
<tr>
<td>Active</td>
<td>True</td>
</tr>
<tr>
<td>Target Table</td>
<td>Problem [problem]</td>
</tr>
<tr>
<td>Condition</td>
<td>email.subject.indexOf(&quot;Problem: &quot;) == 0</td>
</tr>
<tr>
<td>Script</td>
<td></td>
</tr>
<tr>
<td></td>
<td>current.description = email.body_text;</td>
</tr>
<tr>
<td></td>
<td>current.short_description = email.subject.toString().substring(9);</td>
</tr>
<tr>
<td></td>
<td>current.assignment_group.setDisplayValue(&quot;Development&quot;);</td>
</tr>
<tr>
<td></td>
<td>if (email.body.assign != undefined)</td>
</tr>
<tr>
<td></td>
<td>current.assigned_to = email.body.assign;</td>
</tr>
<tr>
<td></td>
<td>current.insert();</td>
</tr>
</tbody>
</table>

Inbound email action example: requesting a change
This example shows you how to set up inbound email actions to create a change request record.

Role required: admin

Inbound Email Actions allow users to log or update incidents on an instance via email. The inbound email action parses the email and responds using a script.

1. Navigate to System Policy Inbound Actions and click New.
2. Populate the form as follows:
<table>
<thead>
<tr>
<th>Field</th>
<th>Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Request Change</td>
</tr>
<tr>
<td>Type</td>
<td>New</td>
</tr>
<tr>
<td>Active</td>
<td>True</td>
</tr>
<tr>
<td>Target Table</td>
<td>Change Request [change_request]</td>
</tr>
<tr>
<td>Condition</td>
<td>email.subject.indexOf(&quot;Change Request: &quot;) == 0</td>
</tr>
<tr>
<td>Script</td>
<td>current.comments = email.body_text;</td>
</tr>
<tr>
<td></td>
<td>current.short_description = email.subject;</td>
</tr>
<tr>
<td></td>
<td>current.notify = 2;</td>
</tr>
<tr>
<td></td>
<td>if (email.body_text.assign != undefined)</td>
</tr>
<tr>
<td></td>
<td>current.assigned_to = email.body_text.assign;</td>
</tr>
<tr>
<td></td>
<td>if (email.body_text.priority != undefined)</td>
</tr>
<tr>
<td></td>
<td>current.priority = email.body_text.priority;</td>
</tr>
<tr>
<td></td>
<td>if (email.body_text.category != undefined)</td>
</tr>
<tr>
<td></td>
<td>current.category = email.body_text.category;</td>
</tr>
<tr>
<td></td>
<td>current.insert();</td>
</tr>
</tbody>
</table>

Inbound email action example: updating an incident

Inbound Email Actions allow users to log or update incidents on an instance via email. The Inbound Email Action parses the email and responds using a script.

Role required: admin

By default, an email received by the instance creates a new incident, sets the Contact type field to Email, and adds the body of the email to the Additional Comments field. More refined Inbound Email Actions can create incident tickets with more data, thus saving the incident management team valuable time.

The following Inbound Email Action applies to email replies. Normally, when a user responds to an email sent by the instance, the inbound email action will match the watermark to an existing incident, and update the incident rather than creating a new record. However, if the watermark is missing, this Inbound Email Action will attempt to match a reply to the original incident.

To define an inbound email action for replies:

1. Navigate to System Policy Email Inbound Actions and click New.
2. Populate the form (see table).
Values automatically set from incoming email
The default inbound action for the Incident table automatically sets the following field values when it receives an incoming email.

### Table 141: Values automatically set from incoming email

<table>
<thead>
<tr>
<th>Field value set</th>
<th>Value used from incoming email</th>
</tr>
</thead>
<tbody>
<tr>
<td>current.caller_id</td>
<td>User ID of the first user whose email address matches the email.from variable.</td>
</tr>
<tr>
<td>current.opened_by</td>
<td>User ID of the first user whose email address matches the email.from variable.</td>
</tr>
</tbody>
</table>

If multiple users have the same email address, the instance first searches for an active user with the email address. Use unique email addresses for each user record whenever possible. If not, having only one active user with the shared email address guarantees that the instance always matches incoming email from this address to the active user.

**Specifying the inbound email processing order**
You can configure a processing order for inbound email actions and use the order to manage multiple filters in inbound email actions.

The Ordered Email Processing (com.glide.email_ordered_processing) plugin is enabled by default for new instances. Users with the admin role can activate the plugin for upgraded instances. The plugin adds the

```javascript
insert the following:
gs.include('validators');
if (current.getTableName() == "incident") {
    current.comments = "reply from: "+ email.origemail + \\n    email.body_text;
    if (email.body.assign != undefined)
        current.assigned_to = email.body.assign;
    if (email.body.priority != undefined && isNumeric(email.body.priority))
        current.priority = email.body.priority;
    if (email.body.category != undefined)
        current.category = email.body.category;
    if (email.body.short_description != undefined)
        current.short_description = email.body.short_description;
    current.update();
}
```
Order column to the Rules [sysrule] table, which the instance uses to determine when to process emails. Admins can also add a command to an action script that halts processing after the script runs.

Configure the processing order
Configure the processing order for inbound email actions to force them to run in a prescribed order.

Role required: admin

1. Navigate to System Policy Email Inbound Actions.
2. Open an existing inbound action or create one.
3. Complete the form and assign an order number to the Order field to establish when this inbound rule should run in relation to other rules. If you upgraded and activated the plugin, the Order field might be named Execution Order.

   **Note:** Ensure each inbound action has a unique Order value to ensure the system stops processing as expected. If multiple inbound actions have the same Order value, the system might evaluate all of the inbound actions, even if one of them contains the event.state="stop_processing"; script or has the Stop processing option selected.

4. To stop rule processing when an inbound email action runs successfully: add the following line to the bottom of the script:
   - Select the Stop processing check box.
   - Add the following line to the bottom of the Actions script:
     ```plaintext
event.state="stop_processing"
```
inbound email actions specify how ServiceNow creates or updates task records in a table when the instance receives an email. The inbound email action looks for a watermark in the email to associate it with a specific task. If the conditions specified in the inbound action are met, the script is run. More Info

<table>
<thead>
<tr>
<th>Name</th>
<th>Application</th>
<th>Target table</th>
<th>Action type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Update Case via AcceptReject</td>
<td>Customer Service</td>
<td>Case:in({n_customerservice_case})</td>
<td>RecordAction</td>
<td>Stop processing</td>
</tr>
</tbody>
</table>

Manage multiple filters in an inbound email action

Use process ordering and the stop_processing command to manage multiple filters in inbound email actions.

Role required: admin

Figure 177: Inbound email actions: Order and Stop processing fields
In this example, you can create new problem records when prb: appears in the subject line and new change requests when chg: appears in the subject line. All other emails are used to create an incident. The actions are set up as follows:

1. Create an action with a condition of Subject > starts with > chg: and the event.state="stop_processing"; command appended to the script.
2. Assign this action an Order value of 100.
3. Create an action with a condition of Subject > starts with > prb: and the event.state="stop_processing"; command appended to the script.
4. Assign this action an Order value of 200.
5. Create an action for incident with no conditions and an Order value of 300.

It is not necessary to add the stop_processing command to the script for the incident action unless you want processing to stop at this rule to avoid continuing to another action.

If either a change request or a problem is created, the stop_processing command stops processing, and no incident record is created. If neither a change request nor a problem is created, the inbound email action for incident creates a record.

Email filters

Email filters enable administrators to specify when to move email to particular mailboxes or to ignore it using a condition builder or a condition script. Email filters are inactive by default.

Default email filters

After activation, these filters are available from the System Mailboxes Filters module:

<table>
<thead>
<tr>
<th>Filter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ignore VCAL</td>
<td>Ignores all email containing vCalendar requests. This filter prevents inbound email actions from creating unnecessary incident records when the instance receives a response to sent email. vCalendar requests in email responses are identified by the EmailUtils script include.</td>
</tr>
<tr>
<td>Ignore header</td>
<td>Ignores email that contains specific headers. This filter overrides the glide.pop3.ignore_headers property.</td>
</tr>
<tr>
<td>Ignore sender</td>
<td>Ignores email from specific senders. This filter overrides the glide.pop3.ignore_senders property.</td>
</tr>
<tr>
<td>Ignore subject</td>
<td>Ignores email with specific terms or phrases in the subject line. This filter overrides the glide.pop3.ignore_subjects property. This filter might not apply to emails arriving from unknown users. Unknown users can be locked out.</td>
</tr>
<tr>
<td>Filter</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Move spam to junk folder</td>
<td>Moves email identified as spam to the Junk folder. This filter changes an email's x-headers to mark a message as spam. This filter does not include the software product of the same name. This filter is enhanced in the Geneva release to provide better spam filtering.</td>
</tr>
</tbody>
</table>

**Note:** Using the Move spam to junk folder filter requires configuring your own email servers as the ServiceNow email infrastructure does not support changing email headers. You can accomplish such filtering with any software capable of changing email headers.

**Email filter script include**

Email filters use a script include called EmailUtils that contains a simple utility function to determine if vCalendar is in the body of the response email. The results of this query are used in a condition script in the Ignore VCAL email filter.

**Spam scoring and filtering**

Every message sent through email servers is assessed for the likelihood of being spam. Based on this assessment, the instance adds headers to each message that can be used for filtering within the customer instance using the Email Filters plugin. This is only available for instances that use the ServiceNow email infrastructure. See KB0549426 for an explanation of email scoring and filtering.

**Activate email filters**

Administrators can activate the Email Filters plugin (com.glide.email_filter).

Role required: admin

1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.
   If the plugin depends on other plugins, these plugins are listed along with their activation status.
   If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).
4. If available, select the Load demo data check box.
   Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.
   You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.
5. Click Activate.

**Create an email filter**

You can create email filters to apply a custom action script or filter actions when email matches your filter's conditions.
Role required: admin

1. Navigate to System Mailboxes Administration Filters.
2. Click New.
3. Complete the fields (see the table).
4. Right-click in the header bar and select Save from the context menu.
   The Filter Actions related list appears.
5. Click New in the related list.
6. Select how the system should react when the conditions of this filter evaluate to true.
   The two choices in the base system are: Mark as Ignored and Move to Junk. You can use the Action script to perform additional email tasks.
Email Filter:

- **Name:** Ignore VCAL
- **Order:** 50
- **Active:** checked
- **Short description:** Ignore emails with calendar attachments, to prevent new incidents from being opened

**Condition script:**

```javascript
var emailInspector = new EmailUtil();
answer = emailInspector.containsCalendarInvite(email);
```

Evaluates condition based on results of a script include.

**Action script:**

```javascript
current.error_string = "Email ignored by 'Ignore VCAL' filter";
```

Additional tasks to perform when the filter condition evaluates to true.

**Filter Actions:**

- **Type:** Ignore VCAL
- **Order:** 100
- **Active:** true
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Brief, descriptive name for this filter.</td>
</tr>
<tr>
<td>Order</td>
<td>Define an order for this filter to determine when it is evaluated. By default, the Ignore VCAL filter has the lowest order number and is evaluated first.</td>
</tr>
<tr>
<td>Active</td>
<td>Select the check box (true) to enable this filter.</td>
</tr>
<tr>
<td>Short description</td>
<td>Concise description of the function of this filter.</td>
</tr>
<tr>
<td>Conditions</td>
<td>Add conditions for this filter with the condition builder or with a condition script. Note that conditions are case sensitive.</td>
</tr>
<tr>
<td>Condition script</td>
<td>Create a script that defines the conditions for this filter. Use this script to access other tables, variables, or methods. For example, the condition script for the Ignore VCAL filter looks for the results of the EmailUtils script include, which detects vCalendar attachments.</td>
</tr>
<tr>
<td>Action script</td>
<td>Use the action script to define additional behavior to be performed when the filter condition evaluates to true. This might include an email action not included in the default filter actions. In the base system, the action script is used to produce the error string that is published to the email log (System Logs Email).</td>
</tr>
</tbody>
</table>

**Note**: Before creating additional email actions with a script, see *Inbound Email Actions*. Like business rules, inbound email actions use both conditions and scripts and can provide a number of useful actions on emails the instance receives.

**Email retention**

You can archive and eventually destroy email messages that you no longer need or if your Email table is excessively large.

Email retention is available starting with the Helsinki release.

**Email archive and destruction plugins**

The email archiving and destruction feature uses the *Data Archiving* and *Email Retention* plugins. The Data Archiving plugin must be active to archive and destroy email records. The Email Retention plugin provides a set of rules that specify when the system archives and destroys email records.
Note: The Email Retention plugin also prevents the system from deleting watermarks, which are required for inbound email actions to continue to function.

The Email Retention plugin and associated archive and destroy rules are active by default on new instances. On upgraded instances, you must manually activate both the plugin and the archive and destroy rules. ServiceNow recommends that you review and approve these rules before activating them.

If your instance already has a process to manage email records, you do not need to activate the Email Retention plugin. If you want to replace your current process with Email Retention, be sure to deactivate the current process before activating the archive and destroy rules.

Archiving and destroying email records

Archiving means moving records from the Email [sys_email] table to the Archive Email [ar_sys_email] table when they exceed the archive rule time limit. Destroying means deleting records in the Archive Email table when they exceed the destroy rule time limit.

Note: When a destroy rule deletes email records, associated watermarks are not deleted. They are preserved to ensure that your inbound email actions continue to function.

Default archive and destroy rules

Email Retention provides these email archive rules:

- Emails - Ignored and over 90 days old: archives email message records that were created more than 90 days prior to the current date and are of type received-ignored or sent-ignored.
- Emails - Over a year old: archives email message records that were created more than 365 days prior to the current date.

Email Retention also provides this email destroy rule:

- Email Archive - Over a year old: destroys email records that have been archived for more than 365 days prior to the current date.

With these default settings, your email messages are kept on the instance for a total of two years: one year in the Email table, and one year in the Email archive table. At the end of this period, the system deletes the expired email records from the Email archive table.

Note: By default these rules are active on new instances and inactive on upgrades. The system runs archive and destroy rules when you activate them.

Compatibility with other record management implementations

If you are already using another method to manage email records, such as table cleaners, you do not have to use the Email Retention feature. To prevent unexpected record deletion, ServiceNow recommends that you avoid using multiple email management processes on the same instance at the same time.

Note: For assistance replacing your existing record management implementation with Email Retention, contact your professional services or sales representative.
Effects of archiving and deleting email records

Inbound email actions copy the body of an email to the work notes of the related record. If the inbound email record is later deleted, the work notes still contain a text copy of the email.

When the system sends an email message about a record, the activity formatter displays a Sent Email section with a link to the email message. If the system archives the email message, the activity formatter removes Sent Email section. When the system deletes the email message, it is no longer visible in the activity formatter nor the work notes.

Note: Set the archive time length long enough so your users can access sent emails though the activity formatter.

Archiving email records changes the methods available to the system to identify inbound email as a reply. After archiving an email record, the system can no longer use the In-Reply-To field to match an incoming email to an email record. However, the system can still match incoming email to an existing record from a record number or watermark.

Activate the Email Retention plugin
The Email Retention plugin provides archive and destruction rules for email messages. It is active by default for new instances, but must be activated for upgrades.

Required role: admin

The Email Retention plugin requires these plugins:

- Data Archiving
- System Mailboxes

1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.
   - If the plugin depends on other plugins, these plugins are listed along with their activation status.
   - If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).
4. If available, select the Load demo data check box.
   - Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.
   - You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.
5. Click Activate.

Archive email manually
You can archive email messages manually on demand instead of waiting for the instance to archive them based on a scheduled job.

Role required: admin

Email Retention provides these email archive rules:

- Emails - Ignored and over 90 days old: archives email message records that were created more than 90 days prior to the current date and are of type received-ignored or sent-ignored.
• Emails - Over a year old: archives email message records that were created more than 365 days prior to the current date.

You can manually archive email messages that meet these archive rules or any additional archive rules that you create.

**Note:** An archive record must be active for the instance to be able to process records with it.

1. Navigate to System Archiving Archive Rules.
2. Open the email archiving rule that you want to modify.
3. Click Recalculate Estimate to see how many records in the Email [sys_email] table are going to be archived. The estimate appears in the Record estimate field.
4. Click Run Archive Now.

**Note:** You can also archive related records.

---

**Watermarks on notification emails**

By default, the system generates a watermark label at the bottom of each notification email to allow matching incoming email to existing records. Each watermark includes a random 20-character string that makes it unique.

Starting with the Jakarta release, the system automatically generates randomized watermarks for notification emails in base systems. The random 20-character string reduces the possibility of a watermark being guessed or coincidentally matching the watermark of an email from another instance.

**Note:** If you are upgrading from a release before Jakarta, random watermark support is optional and requires the Random Watermark Support plugin to be activated. For details on the plugin and related upgrade considerations, see Notifications upgrade information.

---

**Watermark format**

The email watermark always begins with "Ref:" to identify the label as a watermark. After this identifier, the default label is 31 characters in length and consists of:

• Customizable prefix — The default prefix is MSG.
• Auto-numbered identifier — The numeric string identifying the source record, such as incident, problem, or change request.
• An underscore character followed by a random 20-character string
When inbound emails are processed, the system matches random watermarks to the appropriate source records.

**Watermark configuration**

Watermarks are always generated, but you can configure them to:

- Create a custom watermark prefix for each instance to prevent accidentally triggering events in the wrong instance.
- Have custom prefix characters after MSG
- Be hidden globally
- Be omitted from individual email messages

If watermarks are omitted from email notifications, inbound email actions might not work properly. Without a watermark, the system processes inbound email messages as described in *Criteria for matching email to inbound actions* on page 741.

**Note:** Email clients that use the plain text version of the email still show the watermark.

*Create a custom watermark prefix for email notifications*

By default, email notifications use the watermark prefix MSG, but you can create a custom watermark prefix.

**Role required:** admin

Any email notifications that are forwarded from one instance to another might be more easily distinguished with different prefixes for each instance. To avoid unintentionally triggering events in the wrong instance, create a unique watermark prefix for each instance.
Note: Do not use colons (:) in custom watermark prefixes. Colons are a reserved character and may cause the watermark to be ignored.

1. Navigate to System Definition Number Maintenance.
2. Open the MSG record in the Email Watermark [sys_watermark] table.
3. Enter the unique Prefix for this instance.

   ![Number MSG Table]

   - **Prefix**: MSGTEST
   - **Application**: Global
   - **Number of digits**: 7

4. Click Update.

   *Omit an email notification watermark*
   
   You can omit watermarks on email notifications if you do not want the instance to match the notification to an existing record.

   Role required: admin

   When incoming email does not contain a watermark, the system searches the subject line and message body for an incident number. The system attempts to match any incident number that it finds to an existing incident. If there is a matching incident number, the system updates the incident with the values in the incoming email.

1. Navigate to System Notification Email Notifications.
2. Select the email notification to update.
3. Click the Advanced View related link.
4. In the What it will contain section, select the Omit watermark check box.
5. [Optional] If you want response email messages to generate new incidents, remove the record number \${number} variable from the Subject and Message HTML fields.

*Hide email watermarks globally*

Rather than omitting watermarks, it is possible to hide watermarks on a global basis using HTML markup.
Role required: admin

1. Navigate to sys_properties.list in the Application Navigator.
2. Create a new property named glide.email.watermark.visible and set it to false.
   This ensures that all watermarks are hidden on all email messages. This cannot be done on a per-email basis.

System mailboxes

Email messages can be seen in the System Mailboxes menu, which gives you access to the system Inbox, Outbox, and Sent mailbox.

Each provides a filtered view of emails to let you see only what you need to at any given time, including list fields applicable to each. The system mailboxes menu shows your current POP and SMTP status.

The System Mailbox is hosted by ServiceNow, who have sole access to the mailboxes. By default, once the instance pulls an email message, it is deleted from the mail server and stored in the application on the Email [sys_email] table.

System Mailboxes

- Inbound emails: All inbound mail is placed into the Inbox until it is processed. After it is cleared, the email moves to the Received state. If the email message matches the criteria in an inbound email action, the email is changed to Processed. If not, it is changed to Ready. If the system is restarted for any reason (such as during a system upgrade), all inbound mail waits on the external mail server until the system can request delivery.
- Outbound emails: All outbound mail is placed into the Outbox until it is processed. Once cleared, it is moved to Sent (if sent) or Skipped (not sent, as in the case of no valid recipients). If the system is restarted for any reason (such as during a system upgrade), all outbound mail waits in the instance database until the system comes online, and the scheduler looks for mail to deliver.

The email client

The email client enables you to send email directly from any record, such as an incident, change request, problem, or user record.

The email client is available by default, and enabled by default on the incident table.

The email client can be useful in cases where you want to send an email:

- To engage more people in a piece of work
- That includes Cc and Bcc recipients
- That includes personalized comments
- To a third party who doesn't have an account in your instance
- To someone about an incident where you don't have an email notification set up to do exactly what you want

The email client always uses the multipart/mixed content type and supports HTML markup in the message body.

Note: Line breaks do not appear for multi-line fields such as ${description} and ${comments} in the email client template.

Email client interface

The instance's email client interface looks like a standard email interface, which contains a toolbar for text formatting and adding attachments.
Users see an email icon based on the UI version.

- UI16: The email icon (✉️) appears in the more options menu.
- UI15: The email icon (✉️) appears in the form header.

Users click the email icon to launch the email client as a pop-up window.

![Compose Email](image)

**Figure 179: The email client interface**

**Note:** The Subject field on the email client allows a larger character count than the default setting for the Subject field on the Email table. If the subject text from the client is being truncated, increase the Max length value for the Subject field on the Email table.
**Customize the email client**
The email client has default properties and values that you can customize to suit your needs.

### Table 144: Email client default properties and values

<table>
<thead>
<tr>
<th>Property</th>
<th>Default Value</th>
<th>How to Customize</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACL access</td>
<td>Defaults to allowing only users with the itil role to access the email client. Change the ACL rule to control access to the email client.</td>
<td>To control who can see the email client, see <a href="#">Control access to the email client</a> on page 776.</td>
</tr>
<tr>
<td>Email icon</td>
<td>Allows only users with write access to the current table to see the email icon.</td>
<td>To remove the email icon, see <a href="#">Email icon display</a> on page 783.</td>
</tr>
</tbody>
</table>
| Autocomplete | Defaults to only displaying a user's first and last name. A system property controls what columns the email client auto-complete displays. If your organization has several users with the same name, consider adding company or email address columns to help distinguish between users. | • To change search behavior, see [Configure email client auto-complete search results](#) on page 774.  
• To display additional information, see [Additional information in the email client auto-complete](#) on page 775. |
| To         | Defaults to the email address of the caller.                                  | To edit the default value, create an email client template. |
| Cc          | Defaults to the email addresses of the user who opened the incident and all users in the watch_list. | To edit the default value, create an email client template. |
| Subject     | Defaults to the incident number and short description.                        | To edit the default value, create an email client template. |

**Configure email client auto-complete search results**
You can control the email client's auto-complete search results with an email client property.

The following properties on System Properties UI Properties control the autocomplete functionality for the email client.

- Maximum number of autocomplete matches returned to the Email Client. Applies separately to users and groups.

<table>
<thead>
<tr>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
</tr>
</tbody>
</table>

- Include groups in Email Client autocomplete results

<table>
<thead>
<tr>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
</tr>
</tbody>
</table>

**Figure 180: Email client autocomplete properties**
Table 145: Email client properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.ui.email_client.autocomplete.count</td>
<td>Set the maximum number of auto-complete matches.</td>
</tr>
<tr>
<td>glide.ui.email_client.autocomplete.group</td>
<td>Specify whether groups are included in auto-complete results.</td>
</tr>
</tbody>
</table>

Additional information in the email client auto-complete

A system property allows the email client to display additional columns from the User table in the auto-complete list.

Administrators can add this system property to help distinguish between individuals who have the same first and last names, and to ensure that users select the proper recipient for an email.

Table 146: Email client properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.ui.email_client.email_address.disambiguator</td>
<td>Sets the columns from the User [sys_user] table that the autocomplete list displays. Separate each column name with a semicolon character (;). See the system dictionary for a list of available column names. For example, to add the sys_user.email and sys_user.company columns, set the property to: email;company.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: name</td>
</tr>
<tr>
<td></td>
<td>• Location: Add to the System Property [sys_properties] table</td>
</tr>
</tbody>
</table>

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Control access to the email client
You can control access to the email client by changing an ACL rule.

Only users with the itil role can access the email client. The following ACL rule controls this access:

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>EmailClientProcessor</td>
<td>processor</td>
<td>execute</td>
</tr>
</tbody>
</table>

Note: Because the visibility of the email icon is determined by whether the current user has write access to the table, it is possible that a user may be able to see the email icon and still not open the email client.

Create an email client template
You can create a different template for each table that uses the email client.

Role required: admin

The email client uses its own email templates to define default values for fields. You can use HTML formatting to enter the content of the message body, rather than plain text.

1. Navigate to System Policy Email Client Templates.
2. Click New.
3. Fill in the fields on the Email Client Template form.
IT Support

To: employee1@example.com, employee2@example.com, employee3@example.com

Cc: itil@example.com

Bcc:

Subject: Incident - ${number}

Body HTML:

Regarding incident ${number},

IT Support

P
### Table 148: Email client template form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a unique template name.</td>
</tr>
<tr>
<td>Content type</td>
<td>Select HTML or plain text to create the body of the template.</td>
</tr>
<tr>
<td>Table</td>
<td>Select the table that the template applies to. Enable the email client for the same table.</td>
</tr>
<tr>
<td>To</td>
<td>Enter a comma-separated list of either field names that contain user email addresses or specific email addresses.</td>
</tr>
<tr>
<td>Cc</td>
<td>Enter a comma-separated list of either field names that contain user email addresses or specific email addresses.</td>
</tr>
<tr>
<td>Bcc</td>
<td>Enter a comma-separated list of either field names that contain user email addresses or specific email addresses.</td>
</tr>
<tr>
<td>Subject</td>
<td>Enter a description of the email. The description can contain a comma-separated list of field names or specific values.</td>
</tr>
<tr>
<td>Body HTML</td>
<td>If you selected HTML for the Content type, enter the content of the message body using the HTML editor toolbar to format the HTML. You can include variables from the Select variables column. Variables map to column names available from the notification table, its parent tables, and reference tables. Use variables to include values from a record in the table, such as an incident short description or comments and work notes.</td>
</tr>
<tr>
<td>Body text</td>
<td>If you selected plain text for the Content type, enter any text or mail script that you want to appear in the message body.</td>
</tr>
</tbody>
</table>

4. Click Submit.

**Note:** If the Client Templates module is not visible, enable the module.

Here is a sample template for the Incident table.

```plaintext```
template.print("Incident number -" + current.number + "\n");
```
Here is how the template populates an incident email.
Set the from address with an email client template
Use an email client template to set a default value for the From field if it should be different from the system default.

Role required: admin

For example, you can dynamically set the From field to the email address of the current user.

1. Navigate to System Policy Email Client Templates.
2. Select an existing template or create one. For example, select the Incident Template record.
3. Configure the form to add the From field.
4. Enter a script to add a default value to the From field.
   
   For example, the following script displays the current user name and the current user email address:
   
   ```javascript
   javascript:gs.getUserDisplayName()+" <"+ gs.getUser().getEmail()+" >"
   ```

Display an editable From field
By default, the email client does not display a From field on email messages, but you can add one and have it be editable.

Role required: admin

By default, the email client uses an email address taken from the email account. To display an editable From field in the email client:

1. Navigate to System Properties UI Properties.
2. Select the Yes check box for Override the email 'From:' address in the email client (glide.ui.email_client.from).

**Display the Reply To field**

By default, the email client does not display the Reply to field because users cannot change this address. But you can display this field using a UI property.

Role required: admin

The email client always uses the same Reply to address as that defined for email notifications. This ensures that the email has a valid watermark and can generate inbound email actions as normal. If you want to change the global reply-to address you must configure your instance to use your own SMTP server.

1. Navigate to System Properties UI Properties.
2. In the Override the email 'Reply to:' address in the email client (glide.ui.email_client.reply_to) field, select the Yes check box.

**SMS delivery with the email client**

A property is available that lets the user select an option to send a notification via SMS.

The *Subscription Based Notifications plugin* activates the following system property:

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.email_client.show_sms_option</td>
<td>Specify whether a check box appears in the email client for sending the message to the user's SMS device. If no SMS device exists, the email client sends the message to the primary email device.</td>
</tr>
</tbody>
</table>
Quick messages allow you to insert predefined text into the message body of the email client.

**Role required:** admin

Selecting a quick message fills the Message Text field with the body specified in the quick message. After you define one or more quick messages, the Quick Message selector appears in the email client. Use the following syntax: `${variable_name}`.

---

**Note:** If you add attachments to the Quick Message templates, the attachments are not sent as part of the email distribution.

1. Navigate to System Policy Email Quick Messages.
2. Click New.
3. Fill in the Email Client Canned Messages form.

---

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>Enter a name to appear in the Quick Message selector.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
</tr>
<tr>
<td>Active</td>
<td>Select this check box to make the quick message available for selection. Clear this check box to remove the message from the Quick Message selector.</td>
</tr>
<tr>
<td>User</td>
<td>Select the user who has access to this quick message. Selecting a user restricts access to that user only. Leave the field blank to have no user-based restrictions.</td>
</tr>
<tr>
<td>Group</td>
<td>Select the group whose members have access to this quick message. Selecting a group restricts access to members of that group only. Leave the field blank to have no group-based restrictions.</td>
</tr>
<tr>
<td>Body</td>
<td>Enter the text you want to insert into the Message Text field. By default, the field supports HTML format.</td>
</tr>
</tbody>
</table>

4. Click Submit.
Email icon display
You can use access control rules to hide or display the email icon on forms.

Users with write access to the current table can see the email icon. To remove the icon, remove the user's write access to the table. Typically you do this in one of two ways:

- Make the user an Employee Self-Service (ESS) user. ESS users do not have a user role, and without a role they do not have write access to the Incident table. Making a user an ESS user, therefore, hides the email icon on the Incident form.
- Create a custom ACL rule and user role that does not have write access to the table. The default ACL rule for the email client checks to see if the user has the itil role. If you grant users a custom role other than itil, then any such users will not see the email icon.
Remove or display the email icon for a table by setting the email_only dictionary attribute to true or false on the table's collection record. This will not display the email icon for users without write access to the table. For more detail see Dictionary attributes.

**Email Service**

Email Service installs the Email API on the instance.

By default, Email Service only allows admin users to access the Email API. Administrators can grant access to the Email API by:

1. Adding an access control for creating records in the Email [sys_email] table linked to the email_api_send role.
2. Assigning the email_api_send role to the non-admin user.
3. Verifying the non-admin user has read access to the notification target table. For example, an email notification for an incident, requires read access to the Incident table.

Non-admin users with the email_api_send role can access the Email API from the REST API explorer.

**Activate Email Service**

Users with the admin role can activate the Email Service plugin (com.glide.email.service) to enable the Email API.

Role required: admin

1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.
   - If the plugin depends on other plugins, these plugins are listed along with their activation status.
   - If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).
4. If available, select the Load demo data check box.
   - Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.
   - You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.
5. Click Activate.

**Grant access to the Email API**

To grant non-admin users access to the Email API, administrators must create an access control and assign a special role.

Role required: admin

For additional details, see Email API.

1. Elevate privileges to security_admin.
3. Click New.
4. Create an access control for the Email [sys_email] table.
<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>record</td>
</tr>
<tr>
<td>Operation</td>
<td>create</td>
</tr>
<tr>
<td>Admin overrides</td>
<td>Selected</td>
</tr>
<tr>
<td>Name</td>
<td>sys_email</td>
</tr>
<tr>
<td>Requires role</td>
<td>email_api_send</td>
</tr>
</tbody>
</table>

5. Assign the email_api_send role to the non-admin user.

6. Verify the non-admin user either has read access to all records in the notification target table or has read access to a specific record in the table.
   For example, to work with incident notifications the non-admin user needs access to the Incident table. You can provide record access by:
   • Granting the user an appropriate role, such as the itil role.
   • Selecting a specific incident that was opened on behalf of the user.

Email diagnostics and troubleshooting inbound and outbound email

The Diagnostics and Connection page provides information on the current state of your email configuration. This page includes status on email properties, scheduled jobs, and email account connections that affect how your instance receives and sends email.

**Email diagnostics**

Email diagnostic information can help you identify problems with inbound or outbound email. The following video shows different steps to determine why your instance is not receiving inbound emails. One of the steps uses email diagnostics to check the email connection status and email reader scheduled job.

Navigate to the Diagnostics and Connection page from either of these modules:

• System Mailboxes Email Diagnostics
• System Diagnostics Email Diagnostics

**Figure 183: Email Diagnostics and Connection page**
### Diagnostics and Connection

#### Email Sending is Operational

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Status</th>
<th>Type</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email Sending</td>
<td>Enabled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Email Sending Queue</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Last Sent Email</td>
<td>2017-06-16 15:15:50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Status</th>
<th>Type</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMTP Sender State</td>
<td>Ready</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processing Time</td>
<td>20ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Job Last Run</td>
<td>2017-06-16 15:15:59</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Status</th>
<th>Type</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMS Sender State</td>
<td>Ready</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processing Time</td>
<td>2ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Job Last Run</td>
<td>2017-06-16 15:15:11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Email Receiving is Non-Operational

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Status</th>
<th>Type</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email Receiving</td>
<td>Disabled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Last Received Email</td>
<td>None Received</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Status</th>
<th>Type</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email Reader State</td>
<td>Ready</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processing Time</td>
<td>4091 ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Job Last Run</td>
<td>2017-06-16 15:15:15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Connection Status

<table>
<thead>
<tr>
<th>Status</th>
<th>Account</th>
<th>Type</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ServiceNow SMTP</td>
<td>smtp</td>
<td>Connection Successful</td>
</tr>
<tr>
<td></td>
<td>ServiceNow POP3</td>
<td>pop3</td>
<td>Connection Failed</td>
</tr>
</tbody>
</table>

### Related Links

- Modify Email Sending/Receiving
- SMTP Sender Job
- SMS Sender Job
- Email Reader Job
For quick status on a field, point to the green check mark or red X icon. The check mark icon indicates that the item is operational or healthy, while the X icon indicates that the item is not operational or within the expected range.

**Table 152: Mail diagnostics**

<table>
<thead>
<tr>
<th>Diagnostic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email Sending is [Status]</td>
<td>Status of outbound email as either Enabled or Disabled. To change the status, click the Modify Email Sending/Receiving related link, and in the Email Properties form, update the Email sending enabled property.</td>
</tr>
<tr>
<td>Email Sending</td>
<td>Status of outbound email as either Enabled or Disabled. To change the status, click the Modify Email Sending/Receiving related link, and in the Email Properties form, update the Email sending enabled property.</td>
</tr>
<tr>
<td>Email in Queue</td>
<td>Number of email messages in the Outbox.</td>
</tr>
<tr>
<td>Last Sent Mail</td>
<td>Date and time the last email message was sent.</td>
</tr>
<tr>
<td>SMTP Sender State</td>
<td>Current state of the SMTP Sender job, which determines how often to send email. By default, this job runs every minute. If the state is anything other than Ready, the instance may not be able to send email. To update the SMTP Sender state, click the SMTP Sender Job related link, and in the Schedule table, open the SMTP Sender record to be changed.</td>
</tr>
<tr>
<td>SMTP Processing Time</td>
<td>Duration of the last SMTP Sender job run. This value should be shorter than the SMTP Sender interval.</td>
</tr>
<tr>
<td>SMTP Job Last Run</td>
<td>Date and time when the SMTP Sender job last ran.</td>
</tr>
<tr>
<td>Default SMTP Status</td>
<td>Indication of whether the SMTP connection was successful, shown only if the email accounts feature is active. Click Default SMTP to change your SMTP account settings.</td>
</tr>
<tr>
<td>SMS Sender State</td>
<td>Current state of the SMS Sender job, which determines how often to send SMS notifications. By default, this job runs every minute. If the state is anything other than Ready, the instance may not be able to send SMS notifications. To update the SMS Sender job, click the SMS Sender Job related link, and in the Schedule table, open the SMS sender record to be changed.</td>
</tr>
<tr>
<td>SMS Sender Processing Time</td>
<td>Duration of the last SMS Sender job run. This value should be shorter than the SMS Sender interval.</td>
</tr>
<tr>
<td>Diagnostic</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>SMS Sender Job Last Run</td>
<td>Date and time when the SMS Sender job last ran.</td>
</tr>
<tr>
<td>Email Receiving is [Status]</td>
<td>Status of inbound email as either Enabled or Disabled. To change the status</td>
</tr>
<tr>
<td></td>
<td>for email receiving, click the Modify Email Sending/Receiving related link,</td>
</tr>
<tr>
<td></td>
<td>and in the Email Properties form, update the Email receiving enabled property.</td>
</tr>
<tr>
<td>Last Received Email</td>
<td>Date and time the last email message was received.</td>
</tr>
<tr>
<td>Email Reader Status</td>
<td>Current state of the email reader job, which downloads any email waiting</td>
</tr>
<tr>
<td></td>
<td>on the mail server and creates email.read events.</td>
</tr>
<tr>
<td></td>
<td>To update the Email Reader Status job, click the Email Reader Job related</td>
</tr>
<tr>
<td></td>
<td>link, and in the Schedule table, open the email reader record to be changed.</td>
</tr>
<tr>
<td>Email Reader Processing Time</td>
<td>Duration of the last reader job run. This value should be shorter than the</td>
</tr>
<tr>
<td></td>
<td>reader interval.</td>
</tr>
<tr>
<td>Job Last Run</td>
<td>Date and time when the reader job last ran.</td>
</tr>
<tr>
<td>Connection Status</td>
<td>The result of the test connection to the accounts. The connection is tested</td>
</tr>
<tr>
<td>{Accounts}</td>
<td>every time you load the page.</td>
</tr>
</tbody>
</table>

**Troubleshooting email problems**

See the following resources on troubleshooting inbound and outbound email problems.

<table>
<thead>
<tr>
<th>Error or symptom</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instance not receiving inbound email</td>
<td>See Inbound Email Troubleshooting, ServiceNow KB0524472. This KB article also provides</td>
</tr>
<tr>
<td></td>
<td>links to a video series on troubleshooting inbound emails.</td>
</tr>
<tr>
<td>Instance not sending outbound email</td>
<td>See Troubleshooting Outbound Email, ServiceNow KB0521382. This KB article also provides</td>
</tr>
<tr>
<td></td>
<td>links to a video series on troubleshooting outbound emails.</td>
</tr>
<tr>
<td>Error or symptom</td>
<td>Solution</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Email from Outlook produces an empty Incident record containing an attachment named winmail.dat.</td>
<td>Configure the local Outlook client or Exchange server to not send Rich Text formatted (RTF) data to the instance. To prevent Windows email from containing a winmail.dat file, see Microsoft KB 138053 for information on configuring Exchange.</td>
</tr>
</tbody>
</table>

**Push notifications**

In addition to sending email and SMS notifications, an instance can send push notifications to mobile devices.

A push notification is a text message that appears on a user's mobile device to alert them about something important or to ask them to perform an action. Your instance supports push notifications.

![Figure 184: An example push notification](image)
Use push notifications to send messages to users when certain conditions are triggered on your instance, such as the assignment of an incident to the user. A push notification can even ask for a reply, and the instance can process the reply by acting on the related records. For example, you can have the instance send an approval request for a Change to a user. You can let the user approve or deny the Change by clicking a response button on the push notification. The user’s response can then update the status of the Change record.

You can set up push notifications in a similar manner to email and SMS notifications. Determine:

- who to send the notification to
- when it should be sent
- what it should contain

By default, the ServiceNow mobile application supports push notifications. But you can also develop your own push application and configure your instance to send push notifications to it.

**Push notification setup**

Push notification setup differs depending on the mobile or push application that you want your users to use. For an overview, see:

- *Push notification setup with the ServiceNow mobile application* on page 797

  **Note:** Push notifications for on-premise instances are not supported.

- *Push notification setup with a custom push application* on page 804. If you create your own application, you must understand how push notifications and the Apple Push Notification Service system work. For more information, see the APNs Overview in the *Local and Remote Notification Programming Guide* for Apple developers.

  **Attention:** Apple does not guarantee delivery of all push notifications. Review the Quality of Service (QoS) information in the *Local and Remote Notification Programming Guide* for Apple developers.

**Push notification system**

The push notification system involves several key elements that manage the delivery of push messages, push notification responses, and push feedback.

**Customer instance**

Your ServiceNow instance.

**Push proxy**

An instance that collects all push notifications that go to the ServiceNow mobile application and forwards them to the ServiceNow iOS or Android applications. If you create a custom push application, you do not use the push proxy.

**Push provider**

The provider of push messages, which is the Apple Push Notification service (APNs) or Google Cloud Messaging (GCM) service, for the ServiceNow mobile app or custom mobile apps.

**Feedback provider**

The provider of feedback messages, which tells the instance what devices are no longer valid. The Apple feedback or GCM server handles feedback.
messages for the ServiceNow mobile application on iOS and Android devices respectively.

**Feedback proxy**
The ServiceNow instance that handles feedback messages from the Apple feedback server.

**Push application on a mobile device**
The application, such as the ServiceNow mobile application. You can also build and customize your own push application.

**Push notification process**
The push notification process is as follows:

1. Activity on the instance triggers a push notification.
2. The instance looks for who to send the notification to and checks the user notification preferences to find their push device settings.
3. The instance sends the push notification to the push notification service, either the Apple Push Notification service (APNs) or Google Cloud Messaging (GCM) service. If you are using the ServiceNow mobile app, the instance sends the notification through a push proxy instance, which then forwards the notification to the APNs or GCM service.
4. The push notification service sends the notification to the user’s push application. When the instance sends the notification to the push notification service, it includes message content along with the instance name and ID. This information ensures that a response to the notification is sent back to the correct instance. If the user can reply to the notification, such as sending an approval to a change request, the response is sent via REST message back to the instance.
5. The instance identifies a script to run to handle the response.
6. The script performs an action on the instance, such as marking a change request approved. If there is invalid JSON or if the script fails, an error response is sent back to the device.

The following diagram shows the elements of the push notification system with the ServiceNow mobile application. Within the ServiceNow infrastructure is your instance, the optional push proxy instance, and the ServiceNow feedback proxy. External to ServiceNow are the messaging services (APNs or GCM) and user mobile devices, which include the application that is registered to receive push notifications. See *Push feedback* on page 793 for an explanation of the feedback service.

**Figure 185: Push notification system with the ServiceNow mobile app**
Push notification responses

With custom push applications, you can have your users act on records in the instance by responding to a push notification.

The actions that they can take are defined in a script that you associate with the notification message. The response is sent to the instance in this format:

https://{instance_name}/api/now/v1/push/{application Name}/action/{action}

The application name is the push application the user is using. The application name must match the application name in the Push Application [sys_push_application] table. The action is the Sys ID of the action in the Push Notifications Actions [sys_push_notif_act_script] table.
**Push feedback**

Feedback refers to the information about failed iOS message delivery and the iOS push applications that can no longer receive push notifications.

The instance uses a scheduled job to pull feedback data every hour from the APNs. When the APNs determines that a device can no longer receive push messages, the corresponding device is set to inactive, making it unable to receive push notification messages. The Push Feedback [sys_push_feedback] table shows the token for the device that failed. If the same device is again able to receive push notifications, the device might receive the same token from the APNs. A new record is inserted into the Push Notification Installation [sys_pushnotif_app_install] table.

**Activate push notifications**

Several plugins must be activated to use push notifications. If you have the Mobile UI (com.snc.service_management_m) plugin active, push notification plugins are automatically activated.

Role required: admin

You must have the following plugins active on your instance:

- **Push Notification**: Provides the necessary components and REST APIs to send push notifications to mobile devices.
- **Notification System Push Addon**: Adds support for push notifications to the existing notification system.

This plugin is installed in the push notification infrastructure:

- **Push Feedback**: Handles feedback from Apple on which devices are no longer valid so they do not keep receiving push notifications.

1. In the HI Service Portal, click Service Requests Activate Plugin.
2. Fill out the form.

<table>
<thead>
<tr>
<th>Target Instance</th>
<th>Instance on which to activate the plugin.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plugin Name</td>
<td>Name of the plugin to activate.</td>
</tr>
<tr>
<td>Specify the date and time you would like this plugin to be enabled</td>
<td>Date and time must be at least 2 business days from the current time.</td>
</tr>
</tbody>
</table>

**Note:** Plugins are activated in two batches each business day in the Pacific time zone, once in the morning and once in the evening. If the plugin must be activated at a specific time, enter the request in the Reason/Comments.

| Reason/Comments | Provide any information that would be helpful for the ServiceNow personnel activating the plugin. For example, if you need the plugin activated at a specific time instead of during one of the default activation windows. |

3. Click Submit.
Installed with push notifications

Several types of components are installed with the push notifications plugins.

Tables installed with push notifications

These tables are installed with push notifications.

<table>
<thead>
<tr>
<th>Table name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push Applications [sys_push_application]</td>
<td>Push applications registered to the instance to receive push messages.</td>
</tr>
<tr>
<td>Push Default Registrations [sys_push_notif_default_reg]</td>
<td>Contains all the notifications users are automatically subscribed to for a given push application. You can add notifications to this table on the Push Default Registrations related list on the Push Application form.</td>
</tr>
<tr>
<td>Push Feedbacks [sys_push_feedback]</td>
<td>Feedback from the APNs that tells the instance which push devices can no longer receive push messages. The feedback is handled either on the same instance where your notifications are triggered, or on a central instance that uses a REST call to tell your instance which push applications to deactivate.</td>
</tr>
<tr>
<td>Push Message Attribute Definitions [sys_push_notif_msg_attr_def]</td>
<td>The attribute definitions used for push message content specification.</td>
</tr>
<tr>
<td>Push Message Attribute Values [sys_push_notif_msg_attr_val]</td>
<td>The values associated with push messages.</td>
</tr>
<tr>
<td>Push Notifications [sys_push_notification]</td>
<td>The push notifications that the instance attempted to send to users.</td>
</tr>
<tr>
<td>Push Notification Actions [sys_push_notif_act_script]</td>
<td>The action scripts that the instance uses in response to an actionable push message.</td>
</tr>
<tr>
<td>Push Notification Installations [sys_push_notif_app_install]</td>
<td>The devices with push apps where users agreed to receive push notifications. This table lists the records by the token for the push app. The instance uses this information to know which push device and app to send notifications to. Records are created in this table when a user logs on an instance with the push app. The Mobile Devices [sys_mobile_devices] table, which is installed with the Mobile UI plugin, contains all the user devices that logged in to the instance with the ServiceNow mobile application.</td>
</tr>
<tr>
<td>Push Notification Messages [sys_push_notif_msg]</td>
<td>Messages customized for push notifications. These messages can be associated with a notification.</td>
</tr>
<tr>
<td>Push Notification Message Contents [sys_push_notif_msg_content]</td>
<td>The entire content, including JSON, for push messages.</td>
</tr>
<tr>
<td>Table name</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Push Platforms [sys_push_platform]</td>
<td>The platforms that are supported for push notifications, and the maximum payload size.</td>
</tr>
</tbody>
</table>

**Business rules installed with push notifications**

These business rules are installed with push notifications.

<table>
<thead>
<tr>
<th>Business rule</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Build Device and Subscriptions</td>
<td>Push Installation [sys_push_notification_installation]</td>
<td>Automatically creates a notification device on a user's notification preferences when the user registers a mobile application with the instance.</td>
</tr>
</tbody>
</table>

**Outbound REST messages installed with push notifications**

These outbound REST messages are installed with push notifications.

<table>
<thead>
<tr>
<th>REST message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ServiceNowMobileApp Push</td>
<td>The REST message that you can use with your custom iOS mobile app.</td>
</tr>
</tbody>
</table>

**Roles installed with push notifications**

These roles are installed with push notifications.

<table>
<thead>
<tr>
<th>Role</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>push_admin</td>
<td>Can create and modify push notifications.</td>
</tr>
</tbody>
</table>

**Push components installed with push notifications**

These components are installed with push notifications.

<table>
<thead>
<tr>
<th>Push application</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ServiceNowPushApp</td>
<td>The push application record for the ServiceNow mobile application.</td>
</tr>
</tbody>
</table>

**Note:** The ServiceNow mobile application automatically subscribes users to several push notifications. You can see the list of these notifications in the Push Default Registrations related list on the ServiceNowPushApp application record.
Table 154: Message content installed with push notifications

<table>
<thead>
<tr>
<th>Message content</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ConnectMessageContent</td>
<td>The payload for ServiceNow connect messages.</td>
</tr>
<tr>
<td>Generic Approval (Background)</td>
<td>The payload that provides an approval and rejection option to the user</td>
</tr>
<tr>
<td></td>
<td>receiving the push message.</td>
</tr>
<tr>
<td>Generic Approval (Foreground)</td>
<td>The payload that provides an approval and rejection option to the user</td>
</tr>
<tr>
<td></td>
<td>receiving the push message.</td>
</tr>
<tr>
<td>Generic Record Payload</td>
<td>A generic payload that you can use to send push messages to users.</td>
</tr>
</tbody>
</table>

Table 155: Push notification actions installed with push notifications

<table>
<thead>
<tr>
<th>Push notification action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approval - Approve</td>
<td>Allows an administrator to approve a request.</td>
</tr>
<tr>
<td>Approval - Reject</td>
<td>Allows an administrator to reject a request.</td>
</tr>
</tbody>
</table>

Table 156: Push notifications installed with push notifications

<table>
<thead>
<tr>
<th>Push notifications</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
</table>

Push notification properties

Push notifications provides several properties to customize the setup.
Add these properties to the System Properties [sys_properties] table.

Table 157: Push notification properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.push.debug</td>
<td>Creates entries in the system log for push notification errors.</td>
</tr>
<tr>
<td>glide.push.feedback.debug</td>
<td>Creates entries in the system log for feedback sent by the APNs for custom</td>
</tr>
<tr>
<td></td>
<td>iOS push applications.</td>
</tr>
<tr>
<td></td>
<td>Default value</td>
</tr>
<tr>
<td></td>
<td>false</td>
</tr>
<tr>
<td></td>
<td>false</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>glide.push.notification.ttl_seconds</td>
<td>Specifies a time period after which a queued push notification expires. After a push notification is triggered, it is queued and finally processed by a scheduled job. If the time the notification sits in the queue exceeds this value, the notification is not sent. Check the Push Notifications log for more information.</td>
</tr>
<tr>
<td>glide.push.enabled</td>
<td>Enables or disables push notifications.</td>
</tr>
</tbody>
</table>

### Push notification setup with the ServiceNow mobile application

The default ServiceNow mobile application automatically enables push notifications and configures mobile devices for push notifications when users initially log in to the instance with the mobile app.

**Note:** Push notifications with the ServiceNow mobile application are not supported in on-premise instances.

Setting up push notifications involves both the system administrator and users:

- Admin creates or updates push notifications for the ServiceNow mobile app. The admin does not need to set up the mobile devices for users nor update their user preferences for receiving push notifications.
- Users install the ServiceNow mobile app on their iOS or Android mobile devices and set their preferences for receiving notifications on the ServiceNow mobile app.
What to do — admins

Admins create push notifications, similar to setting up email notifications. A push notification has two main parts: the push message and the notification, which includes the push message.

**Note:** The push message and notification must be for the same table.

**Create the push message**

Before creating a push notification, create the push message with the actual message content (JSON payload) to be included in the push notification.

**Create the push notification that includes the push message**

Create the push notification that includes the push message and message content. A push notification specifically sends the push message. You can update a standard platform notification and use it as a push notification that includes the push message.
Add the new push notification to the Push Default Registration table

To ensure that a new push notification is included and enabled in the notification preferences of your users, register a new push notification in the Push Default Registration table. The notification is listed in the notification preferences of your users the next time that they log in to the ServiceNow mobile app.

What to do — ServiceNow mobile app users

**Download the ServiceNow mobile app**

*Install* the ServiceNow mobile app on an iOS or Android mobile device.

**Agree to accept push notifications**

After installing the ServiceNow mobile app, users are asked to accept push notifications. When the instance receives the push notification acceptance message from a user, it creates a record in the Push Notification Installations [sys_pushnotif_app_install] table. This record is what the instance uses to identify the device + mobile application combination necessary to identify a push notification recipient.

The device then:

- Obtains a token that identifies the device.
- Triggers the creation of the device in the user notification preferences.

**Log in to the company instance from the ServiceNow mobile app**

Logging in automatically subscribes users to the push-specific notifications registered in the Push Default Registration table.

**Update preferences for receiving notifications on the ServiceNow mobile app**

Users can *enable or disable notifications* through Notification Settings in the ServiceNow mobile app. They can set additional notification preferences, such as conditions or filters that affect notification delivery, by using the System Settings window on a desktop or mobile browser. For details, see *Setting notification preferences in UI16* on page 822.

Next steps

If you are an admin, review the base system notifications and determine if new push message content and push notifications are needed.

Create a push message

Before you create a push notification, create the push message with the actual message content for the notification.

The *Push notification plugin* must be active. The plugin is active by default, starting with the Geneva release.

Role required: admin
The push message and notification must be for the same table.

2. Fill out the fields on the form (see table).
3. Click Submit.

Table 158: Push Notification Message form fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a descriptive name for the message.</td>
</tr>
<tr>
<td>Push App</td>
<td>Select the ServiceNow Mobile Application.</td>
</tr>
</tbody>
</table>

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### Push Message Content

**Description:** Select the JSON content to be included in the push notification payload.

**Note:** For details on defining payloads that control push notification behavior, see KB0622333. For example, you can specify predefined button pairs (Yes/No, Approve/Reject, Accept/Decline) as part of the push message content.

### Message

**Description:** Enter the message. You can add variables just as you would for other notifications. Any message you enter here overrides the message in the notification.

### Related list

<table>
<thead>
<tr>
<th>Push Message Attribute Values</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optional. Select the attributes that apply to this notification. For details, see Create an attribute value or action for a push message on page 814.</td>
<td></td>
</tr>
</tbody>
</table>

---

Set up the push notification that contains the message created or update an existing push notification to use the push message.

### Create a notification using a push message

Email administrators can create a notification that specifically sends a push notification.

Configure the push message before performing these steps.

**Role required:** admin

You can associate a push message with a standard notification. A push message specifies the text the system sends as part of the push notification to the mobile device.

1. Navigate to System Notification Create Push Notification.
2. Fill out the notification form as necessary (see Create an email notification on page 649 for descriptions of the form fields.
3. Click the What it will contain tab.
4. Next to Push Messages, click the lock icon and select a push message.

**Note:** The push message and notification must be for the same table.

5. If you want this notification to be sent only as a push notification and not as any other type of notification, select Push Message Only.
6. Click Submit.

**Note:** The push message and notification must be for the same table.

If the notification fails, the user is not notified. If the message fails to send because it exceeds the maximum payload, the instance logs the failure in the System Log.
Add the push notification to the Push Defaults Registrations table so that the push notification is listed in the notification preferences for users. Users can then select which notifications they want to receive for the ServiceNow mobile app.

Add a push notification to the Push Default Registrations table

After you create a new push notification, add it to the Push Default Registration table. Push notifications registered in this table are listed and automatically enabled in the notification settings of your ServiceNow Mobile Application users.

Role required: admin

2. Select the ServiceNow Mobile Application.
3. In the Push Application form for the ServiceNow Mobile Application, select the Push Default Registrations tab and click New.
A push application is a mobile app that can receive push notifications from a ServiceNow instance. Create a mobile application record for your customized mobile app and specify how to handle push messages and feedback.

<table>
<thead>
<tr>
<th>Display Name</th>
<th>ServiceNow Mobile Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>ServiceNowPushApp</td>
</tr>
<tr>
<td>Push</td>
<td>REST API</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Application</th>
<th>Global</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Feedback</th>
<th>None</th>
</tr>
</thead>
</table>

Push Notification Message Center... Push Default Registrations (170)

- Notification
  - Notify quiz manager overdue
  - Approval Error Message response
  - Change commented (unassigned)
4. In the Push Default Registration New record, select the notification to be registered.
5. Click Submit.
   The next time that users log in to their instance, the new push notification is included in their list of notifications.

Push notification setup with a custom push application

If you are using your own custom mobile or push application, you must configure your app for use and set up the push contents.

Setting up a push notification infrastructure that uses a custom push app involves a push admin (also called push app developer or mobile app developer) and system administrator. When push admins create a customized push app, they also configure the app, its push message content (payload generators), and optional attributes, such as push action scripts. The admin creates and updates the push notifications for the custom push app. After users install the custom push app and initially log in to their instance from their mobile device, the system automatically creates a device (channel) for the custom app.

**Note:** These instructions are intended for users who develop their own customized push application. You do not need to configure the ServiceNow mobile application.
What to do — push admin

Create the PKCS file that contains the certificate for publishing your custom push app

The PKCS (.p12) file contains the iPhone developer certificate and the private key used to sign the certificate. The instance uses the information in the PKCS file to communicate with the APNs. Attach the .p12 file to the X.509 Certificates (sys_certificate) record (System Definition Certificates) and change the Type to PKCS12 Key Store.

Note: For details on generating the .p12 file with the required certificate and private key, see Configure push notifications and Communicate with APNs using a
Configure the custom push application

1. Create a push application record in the Push Application [sys_push_application] table for the custom push app.

The instance uses this push application record to identify the device + push application combination necessary to determine a push notification recipient.

2. Create push message content.

Create a JSON content payload for different types of push notifications. The content determines how a push notification appears on the push application, and whether the user can send a message in response to the push notification. The push admin can create attribute definitions that specify a default push action script or string, for use in the push message content (next step).

3. Create an attribute value or action for a push message.

You can create attribute values that override the default attribute definitions used in the push message content.

4. (Optional) Create a push action, a server-side script that tells the instance how to handle responses to push notifications.

For an example of a customized push notification, see Push notification example for a custom push app on page 816.

What to do — admin

Create the push messages and push notifications

The administrator creates the push messages, sets up push notifications for the custom push app, and if desired, the content.

Next steps

If you are a push admin, begin the configuration process by creating the push application record for your custom push app.

If you are an admin, create the push messages and push notifications for the custom push app.

Create a push application record for your custom app

Register your customized mobile application with your instance to receive push notifications for the application.
The *Push notification plugin* must be active. The plugin is active by default, starting with the Geneva release.

Role required: admin or push_admin

Push notifications are application-specific: They are sent to one type of mobile application, regardless of how many users have this application installed. If you develop your own mobile application, you must configure it for use by creating a record for it in the Push Application [sys_push_application] table. By default, the ServiceNow mobile application is automatically set up and ready to use.

1. Navigate to System Notification Email Push Application.
2. Fill out the fields on the form (see table).
3. Click Submit.
A push application is a mobile app that can receive push notifications from a ServiceNow instance. Create a mobile application record for your customized mobile app and specify how to handle push messages and feedback.

### More Info

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Name</td>
<td>ServiceNow Mobile Application</td>
</tr>
<tr>
<td>Name</td>
<td>ServiceNowPushApp</td>
</tr>
<tr>
<td>Push</td>
<td>Direct</td>
</tr>
<tr>
<td>Application</td>
<td>Global</td>
</tr>
<tr>
<td>Feedback</td>
<td>-- None --</td>
</tr>
</tbody>
</table>

### Apple

<table>
<thead>
<tr>
<th>Certificate</th>
<th>[Search]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandbox Certificate</td>
<td>[Search]</td>
</tr>
</tbody>
</table>

### Push Notification Message Contents

<table>
<thead>
<tr>
<th>Push app</th>
<th>Push Message Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name</td>
</tr>
<tr>
<td>Connect Notification Content</td>
<td>(function buildJSON(&quot;GlideRecord&quot;/ current...)</td>
</tr>
<tr>
<td>ConnectMessageContent</td>
<td>(function buildJSON(&quot;GlideRecord&quot;/ current...)</td>
</tr>
<tr>
<td>Generic Approval (Background)</td>
<td>(function buildJSON(&quot;GlideRecord&quot;/ current...)</td>
</tr>
</tbody>
</table>
### Table 159: Push Application form fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Name</td>
<td>Enter a descriptive name for the application.</td>
</tr>
<tr>
<td>Name</td>
<td>Enter a descriptive name, without spaces, for the application.</td>
</tr>
<tr>
<td>Push</td>
<td>Select an option:</td>
</tr>
<tr>
<td></td>
<td>• Direct: Send push notifications directly to the push service without going through an intermediary. If you select this option, you must specify an X.509 Certificate or a GCM API key.</td>
</tr>
<tr>
<td></td>
<td>• REST API: Not applicable to custom push apps.</td>
</tr>
<tr>
<td></td>
<td>• None: Do not enable push notifications for this application.</td>
</tr>
<tr>
<td>Feedback</td>
<td>Select an option:</td>
</tr>
<tr>
<td></td>
<td>• Apple: Send push notifications directly to the APNs without going through an intermediary.</td>
</tr>
<tr>
<td></td>
<td>• REST API: Not applicable to custom push apps.</td>
</tr>
<tr>
<td></td>
<td>• None: Do not handle feedback for this push application.</td>
</tr>
<tr>
<td>Apple</td>
<td>The X.509 Certificate and Sandbox Certificate you created on the Apple notifications portal. The certificate enables a device to talk to the APNs. This option appears only if you select Direct for the Push field.</td>
</tr>
<tr>
<td>Google</td>
<td>Select the GCM API key you obtained from Google for the Android push notification.</td>
</tr>
<tr>
<td>Related lists</td>
<td></td>
</tr>
<tr>
<td>Push Notification Message Contents</td>
<td>Select the message content associated with this app.</td>
</tr>
<tr>
<td>Push Default Registrations</td>
<td>Select the notifications that you want automatically subscribed to users who use this application. Users are subscribed to only active notifications.</td>
</tr>
</tbody>
</table>
Create push message content

Push message content specifies additional JSON content in the push notification payload that is sent to the push provider.

You must know how to use JSON with push messages.

Role required: admin or push_admin

Push message content defines the style of push notification that can be sent out for your custom app. You can add custom content, such as a picture, icons, or action buttons for the user to respond to the notification. Use the following variables in the script:

- `current`: properties of the current record.
- `message`: push message sent as the body of the entire push content.
- `attributes`: object of the push message *attributes that you define*.

2. In the Push Notification Message Contents table, click New.
3. Fill out the fields on the Push Notifications Message Content form (see table).
4. Click Submit.
Push notification message content specifies additional JSON content in the push notification payload that is sent to the push provider. Use this record to create the JSON content and specify the provider-specific values, such as a sound or badge.

The following variables are available for use in the script:
- current: access properties of the record that triggered this push notification, such as the fields on an incident record.
- message: access contents of the message that will be sent as the body of the push notification.
- attributes: access attributes defined for this push notification.

```javascript
var json = {
    "app": "default",
    "record": {
        "table": current.getTableName(),
        "sys_id": current.sys_id
    }
};
```
Table 160: Notification Message form fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a descriptive name for the message content.</td>
</tr>
<tr>
<td>Push app</td>
<td>The push application the content can be used with.</td>
</tr>
<tr>
<td>Push Message Generation</td>
<td>Enter a script that determines the message content. See the example scripts.</td>
</tr>
<tr>
<td>Related list</td>
<td></td>
</tr>
<tr>
<td>Push Message Attribute Definitions</td>
<td>Select the attributes that apply to this notification. Attributes can be a value or an action. These attributes are used as default values for the content items you create in the content script. However, any attributes you create with the push message can override these attributes. See Create a push message attribute definition on page 812 for information on creating attributes.</td>
</tr>
</tbody>
</table>

The following is an example of a content record that creates a two-button layout, one to approve something, such as a change request, and one to decline it.

```javascript
var json = {
    "table": current.getTableName(),
    "sys_id": current.sys_id,
    "template": {
        "type": "2 button",
        "button1": {
            "title": "Approve",
            "action": attributes.button_action,
            "parameters": {
                "response": "approve"
            }
        },
        "button2": {
            "title": "Decline",
            "action": attributes.button_action,
            "parameters": {
                "response": "decline"
            }
        }
    }
};
json;
```

Define a push message attribute to specify a default push action script or string that you can use in the push message content.

Create a push message attribute definition
Push message attribute definitions allow you to create reusable properties for push message content specification.
Role required: admin or push_admin

Use an attribute definition to specify a default push action script or string that you can then use in the push message content.

You can override these attributes by creating any push message attribute values.

2. Select a content record or script record.
3. In the Push Message Attribute Definitions related list, click New.
4. Fill out the fields on the form (see table).
5. Click Submit.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attribute Name</td>
<td>Enter a descriptive name for the layout.</td>
</tr>
</tbody>
</table>
Field | Description
---|---
Attribute Type | Select the type of attribute:
  • Action: An action to take on the instance, as defined by a script.
  • String: An arbitrary string to send as part of the message content. The string can specify items like a button label in the message.

Default Script | Select the mobile action script that tells the instance what to do when it receives a response from the push notification. This option appears if you select Action for the Type.

Default Value | Specify an arbitrary string value to be placed in the attribute that is used by the message content. For example, the string could specify a button label. This option appears if you select String for the Type.

For an example of push attributes, see *Push notification example for a custom push app* on page 816 for an example of a push attributes.

If you want to override default attribute definitions, see *Create an attribute value or action for a push message* on page 814.

**Create an attribute value or action for a push message**

Attribute values are associated with push messages to provide a way for the message to include certain types of information in the push notification.

Create default definitions on the Push Message Attribute Definitions related list of the Push Message Content form.

Role required: admin or push_admin

These push message attribute values override values that you set in an attribute definition on the Push Content form.

2. Select a message.
3. In the Push Message Attribute Values related list, click New.
4. Fill out the fields on the form (see table).
5. Click Submit.
Push message attribute values override values that you set in an attribute definition.

Table 162: Push Message Attribute Values form fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attribute</td>
<td>Select a push message attribute definition.</td>
</tr>
<tr>
<td>Value/Action</td>
<td>Enter the value for the attribute or select the push action. This field changes to Value or Action depending on the type of attribute you select in the Attribute field.</td>
</tr>
</tbody>
</table>

For an example of push message attributes, see *Push notification example for a custom push app* on page 816.

(Optional) **Create a push action** to perform an action on the instance.

**Create a push action**

A push action is a server-side script that runs when the instance receives a response to an actionable push message.

Create a push action to perform an action on the instance. For example, you might have an actionable push message that lets the user approve a change request. The action that handles the response should update the Approval field on the relevant Change Request record.

You can use global variables or, optionally, current variables and parameters passed through the JSON content.

Role required: admin or push_admin

1. **Navigate to** System Notification Push Push Action.
2. Fill in the form fields (see table).
3. Click Submit.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a descriptive name for the action.</td>
</tr>
<tr>
<td>Script</td>
<td>Enter the script.</td>
</tr>
</tbody>
</table>

For an example of a push action, see *Push notification example for a custom push app* on page 816

**Push notification example for a custom push app**

This example illustrates a customized push notification, including customized push actions and content.

In this example, you learn how to create a push notification for incidents that are not assigned to anyone. This example assumes that you created your own custom push application that is referred to in this example as MyPushApp. The notification is sent to a user who can respond by accepting assignment to the incident or ignoring it.

**Create the push actions**

First, create push actions that give the user options on how to respond to the push notification. In this example, create two actions: assign to me and ignore. The content of the actions is as follows:

- **Assign to me:**

  ```javascript
  (function runAction(/*Optional GlideRecord*/ current) {
    if (current.getTableName() == "incident" && current.assigned_to == undefined) {
      current.comments = "I have self assigned this incident to myself";
      current.assigned_to = gs.getUser();
      current.update();
    }
  })(current);
  ```

- **Ignore:**

  ```javascript
  (function runAction(/*Optional GlideRecord*/ current) {
    gs.log(gs.getUser() + " ignored this record: " + current.number);
    //writes a message to the system log that the user ignored this incident.
  })(current);
  ```

See *Create a push action* on page 815 for specific steps on how to create these actions.

**Create the push content**

Next, create the JSON content that specifies two buttons used to respond to the incident. The content is as follows:

```javascript
(function buildJSON(/*GlideRecord*/ current, /*String*/ message, /*Object*/ attributes) { 
```
var json = {};

json = {
    "aps": {
        "sound": "default"
    },
    "record": {
        "table": current.getTableName(),
        "sys_id": current.sys_id
    },
    "action": {
        "button1_text": attributes.name_of_button1,
        "button1_action": attributes.action_of_button1,
        "button2_text": attributes.name_of_button2,
        "button2_action": attributes.action_of_button2
    }
};

return json;

The content script specifies two labels and two actions, one for each button. You create attribute definitions for them. But later you override these definitions with the actual button labels and actions on the push message. Here are the definitions:

![Attribute definition examples](image)

Figure 186: Attribute definition examples

**Create the push message**

Next, create a push message that specifies the message that appears to the user: Can you take on a new incident?. The push message associates your custom application MyPushApp with the content you created.
Figure 187: Push message example

The Push Message Attribute Values related list specifies the four items needed for the button label and the action the instance takes when the user clicks that button:

Table 164: Push message attribute values

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>action_on_button2</td>
<td>Ignore</td>
<td>Ignore</td>
<td>The Ignore action is what you specified as a push action. This action is associated with button 2.</td>
</tr>
<tr>
<td>name_of_button2</td>
<td>Ignore</td>
<td>none</td>
<td>Ignore is the label the user sees for button 2.</td>
</tr>
<tr>
<td>name_of_button1</td>
<td>Assign to me</td>
<td>Assign to me</td>
<td>The Assign to me action is what you specified as a push action. This action is associated with button 1.</td>
</tr>
<tr>
<td>action_on_button1</td>
<td>Assign to me</td>
<td>Assign to me</td>
<td>Assign to me is the label the user sees for button 1.</td>
</tr>
<tr>
<td>name_of_button1</td>
<td>Assign to me</td>
<td>none</td>
<td>Assign to me is the label the user sees for button 1.</td>
</tr>
</tbody>
</table>
Create the push notification

Finally, create a push notification that is triggered when a new incident is unassigned. It is sent to a group named Incident Manager. You then associate the push message that you created with the notification. The notification is as follows:

![Notification Unassigned Incident](image)

**When to send**

- **Conditions**: Add Filter Condition, Add "OR" Clause
  - **Assigned to** is empty

**Who will receive**

- **Groups**: Incident Manager

**What to send**

- **Push Messages**: Assign To Me

![Figure 188: Push notification example](image)

Requeue failed push notification messages

Push notification delivery might fail for various reasons. You can view which messages failed and requeue them to be sent out if necessary.

Role required: admin

**Note:** There is no way for the instance to guarantee or confirm push message delivery. For more information on how Apple handles push notifications, see the [Local and Remote Notification Programming Guide](#) for Apple developers.

Messages can also fail to send for several reasons, such as a large message queue or other issue with the instance. You can use a `system property` to control how long the instance queues a push notification after it is triggered.

Push notification message payload size is limited by provider:

- Apple iOS: 2,048 bytes
- Google: 4,096 bytes
Your instance does not send push messages that exceed this limitation. System logs save any failed messages. For details on Apple payload limitations, see the *Local and Remote Notification Programming Guide* for Apple developers.

1. Navigate to System Logs Push Notifications.

   By default, the messages that were created today appear. You can change the filter if necessary. The Type column can have these values:
   - failure: The message could not be sent.
   - pending: The message is queued for processing.
   - success: The message was successfully sent, although not necessarily received by the mobile device.

2. Put any failed messages back into the queue to be resent by selecting the check boxes next to the failed messages, and then selecting Re-queue failed push notifications from the choice list.

3. If some push notifications continue to fail, consider increasing the value in the glide.push.notification.ttl_seconds property. See *Push notification properties* on page 796 for more information.

### Push notification retention

You can archive and eventually destroy push notifications that you no longer need or if your Push Notification table is excessively large.

Push notification retention is available starting with the Jakarta release.

**Push notification archive and destruction plugins**

The push notification archiving and destruction feature uses the Data Archiving and Push Retention plugins. The Data Archiving plugin must be active to archive and destroy push notification records. The Push Retention plugin provides a set of rules that specify when the system archives and destroys push notification records.

In new instances, the Push Retention plugin and associated archive and destroy rules are active by default. On upgraded instances, you must manually activate both the plugin and the archive and destroy rules. Be sure to review and approve the archive and destroy rules before activating them.

If your instance already has a process for managing push notification records, you do not need to activate the Push Retention plugin. If you want to replace your current process with Push Retention, be sure to deactivate the current process before activating the archive and destroy rules.

**Archiving and destroying push notification records**

Archiving means moving records from the Push Notification [sys_push_notification] table to the Push Notification Archive [ar_sys_push_notification] table when they exceed the archive rule time limit. Destroying means deleting records in the Push Notification Archive table when they exceed the destroy rule time limit.

**Default archive and destroy rules**

Push retention provides the following push archive rules:

- Push Notification - Over a year old: archives push notification records that were created more than 365 days prior to the current date.
- Push Notification Archive - Over a year old: destroys push notification records that have been archived for more than 365 days prior to the current date.

With these default settings, your messages are kept on the instance for a total of two years: one year in the Push Notification table, and one year in the Push Notification Archive table. At the end of the period, the system deletes the expired notification records from the Push Notification Archive table.

**Note:** By default these rules are active on new instances and inactive on upgrades. The system runs archive and destroy rules when you activate them.

### Compatibility with other record management implementations

If you are already using another method for managing push notification records, such as table cleaners, you do not have to use the Push Retention feature. To prevent unexpected record deletion, avoid using multiple push notification management processes on the same instance at the same time.

**Note:** For assistance replacing your existing record management implementation with push notification retention, contact your professional services or sales representative.

### Activate the Push Retention plugin

The Push Retention plugin (com.glide.push_retention) provides the retention policy for push notifications, so that you can specify when the system archives and destroys push notification records.

Role required: admin

The Push Retention plugin requires the **Data Archiving** plugin.

1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.
   - If the plugin depends on other plugins, these plugins are listed along with their activation status.
   - If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).
4. If available, select the Load demo data check box.
   - Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.
   - You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.
5. Click Activate.

### Archive push notifications manually

You can manually archive push notifications on demand instead of waiting for the instance to archive them based on a scheduled job.

Role required: admin

Push retention provides these push notification archive rules:

- Push Notification - Over a year old: archives push notification records that were created more than 365 days prior to the current date.
- Push Notification Archive - Over a year old: destroys push notification records that have been archived for more than 365 days prior to the current date.

You can manually archive push notification messages that meet the default archive and destroy rules or any additional archive rules that you create.

1. Navigate to System Archiving Archive Rules.
2. Open the push notification archiving rule, for example Push Notification - Over a year old
3. Click Recalculate Estimate to see how many records in the Push Notification [sys_push_notification] table are going to be archived. The estimate appears in the Record estimate field.
4. Click Run Archive Now.

Subscription-based notifications

Subscription-based notifications enable users to proactively subscribe to items that interest them and unsubscribe from messages that are not mandatory.

Users can also specify additional notification channels that each of their notifications can be configured to use.

Before users can manage the notifications that are sent to them, administrators must create email notifications to which users can subscribe. Administrators can also make subscription-based notifications mandatory so users cannot unsubscribe to them. Then users can subscribe or unsubscribe to the notifications, and add schedules and filters to the subscription to limit the notifications that can be received.

Notifications that administrators mark as subscribable are automatically available in user notification settings. In previous releases, users had to wait until they received a notification before the subscription-based notification appeared in their notification settings.

Administrators should create subscription-based notifications when they do not want to specify users for a notification and want to let users proactively subscribe to the notification.

Subscriptions 2.0 plugin

The Subscription Based Notifications 2.0 plugin must be active to use subscribable notifications. This plugin is active by default on all new and upgraded instances.

The plugin installs the Notification Subscription [sys_notif_subscription] table, which holds user subscriptions to all notifications.

Subscriptions and notification preferences

Users can subscribe to notifications available to them through their notification preferences. In the UI16 interface, all users can set and modify their notification preferences through the Notifications tab of the System Settings window. In the UI15 interface and earlier, admins and users set their notification preferences through the Notification Preferences link in the User form.

Setting notification preferences in UI16

You can set your own notification preferences, including personal subscriptions and channels for receiving them. All users can set these preferences through the Notifications tab of the System Settings window.

With the Notifications tab, you can:
• Search for a specific notification in the list of your notifications.
• Use a global switch to enable or disable all your notifications.
• Enable or disable a particular channel for receiving notifications, as well as create, edit, or delete channels.
• Control the notifications that you receive and apply conditions to restrict notification delivery.
• Create personal notifications, which are subscriptions to notifications that are important to you.

Comparison between notification preferences in UI16 and earlier interfaces

In new and upgraded instances that use the UI16 interface, the System Settings window is the central location for managing your notification preferences. The Notification Preference User Interface (com.glide.notification.preference.ui) plugin is activated by default.
Figure 189: Notification preferences in UI16 and UI15

In UI15 and earlier interfaces:

- Users set notification preferences through the Notification Preferences link in the User form (Self service My Notification Preferences).
• Admins created user devices and set notification preferences for users through the Notification Preferences link in the User form, accessed through the User Administration module (User Administration Users).

**Note:** Admins can revert to the UI15 notification preferences interface by setting the `glide.notification.preference.UI.enabled` property to false.

---

**Manage your notification preferences in UI16**

To access your notification preferences, click the gear icon (⚙️) in the banner frame, and in the System Settings window, click the Notifications tab. You can also access the System Settings by navigating to **Self Service** My Notification Preferences.

---

![Notifications tab in System Settings window](image)

**Figure 190: Notifications tab in System Settings window**

In the Notifications tab, use the following settings to manage your notifications:
<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
</table>
| Search               | Search bar for finding notifications. To find a notification:  
  • Enter the name of the notification you are searching for. When you type the first three characters, the system automatically returns a list of notifications matching the characters entered.  
  • Enter two asterisks to return a list of all notifications in alphabetic order (the notifications are not organized by category). |                                                                                                                                          |
| Allow notifications  | Global switch for enabling or disabling all notifications.                                                                                                                                                     |
| Notification channels| List of your channels for receiving notifications. Use this section to:  
  • Enable or disable a channel by using its toggle switch. If you disable a channel, notifications are not delivered through that channel.  
  • **Add channels** using the Create Channel option.  
  • **Modify channel information**. Click the channel row or the right arrow (>) next to the appropriate channel to edit or delete it. |                                                                                                                                          |
| Notifications by category | List of notification categories that identify and group related notifications. Each category contains the notifications that you can subscribe to.  
To view the notifications in a given category, click the category row or the right arrow (>) next to the appropriate category. You can:  
  • Edit settings for a notification:  
    • Enable or disable channels for the selected notification.  
    • **Apply notification conditions**, such as schedules and filters, that affect the delivery of the notification.  
    • **Create personal notifications**, which are subscriptions to specific notifications that matter to you. |                                                                                                                                          |

Create notification channels

You can add channels to receive your notifications. A notification channel is an email account or voice message system that you have access to.

Role required: user

Notification channels include email addresses, service providers for SMS messages, and mobile applications.

**Note:** If you are using the ServiceNow mobile application or a custom push application, you do not need to create a push channel for your mobile device. The system automatically creates a channel for the mobile app after you initially log in to your instance from your mobile device.

1. Click the gear icon in the banner frame to open the System Settings window, and click the Notifications tab.
2. Click Create Channel.
3. Complete the fields on the New Channel form.
### Field Description

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>A descriptive name for the channel, such as the device or email account.</td>
</tr>
</tbody>
</table>
### Create notification channels

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>The type of channel:</td>
</tr>
<tr>
<td></td>
<td>• Email: for email messages.</td>
</tr>
<tr>
<td></td>
<td>• SMS: for SMS messages.</td>
</tr>
<tr>
<td></td>
<td>• Voice: for phone messages.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> All users with an email address have a primary email channel, which is created automatically after a notification is sent to them.</td>
</tr>
<tr>
<td></td>
<td>• SMS: for SMS messages.</td>
</tr>
<tr>
<td></td>
<td>• Voice: for phone messages.</td>
</tr>
<tr>
<td>Email address</td>
<td>The email address of the channel.</td>
</tr>
<tr>
<td>Phone number</td>
<td>The phone number for SMS messages or for voice messages.</td>
</tr>
<tr>
<td>Service provider</td>
<td>The service provider for SMS messages.</td>
</tr>
</tbody>
</table>

4. Click Save.

The system creates and enables the channel, and adds it to the list of notification channels.

### Modify notification channels

You can update channel information for your notifications, as well as delete channels.

Role required: user

1. Click the gear icon ( ) in the banner frame to open the System Settings window, and click the Notifications tab.

2. In the Notification Channels section, click the channel row or the right arrow (>) next to the channel name.

3. In the Edit Channel form, update the fields (see Create notification channels for descriptions of the form fields).

4. Choose one of the following options:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancel</td>
<td>The system ignores any changes made and returns to the Notifications tab.</td>
</tr>
<tr>
<td>Save</td>
<td>The system updates and saves the channel information you modified.</td>
</tr>
<tr>
<td>Delete</td>
<td>Confirm that you want to delete the channel. The system deletes the channel from the list of notification channels and no longer delivers notifications to that channel.</td>
</tr>
</tbody>
</table>
Apply notification conditions

You can set various conditions and filters to control the notifications you receive. You can also enable or disable an email digest and the delivery of individual notifications by channel.

Role required: user

You can choose to enable certain features and set different conditions that control the notifications you receive. You can:

• Enable or disable an email digest if a digest is available for the notification. An email digest is a single email that summarizes the activity for the notification during a time interval that you specify. Admins configure the email digest content for a notification.

• Enable or disable a channel on which the notification is received.

• Set preconfigured schedules and filters that determine when you receive your notifications.

• Set more advanced filter conditions to limit the notifications delivered to you.

1. Click the gear icon (⚙️) in the banner frame to open the System Settings window, and click the Notifications tab.

2. Select the notification:

   a) In the Notifications By Category section, click the row or right arrow (>) of the category that you want to view.

   b) In the list of notifications for the category, click the row or right arrow (>) next to the notification that you want to edit.

3. To enable or disable an email digest for the notification, if an email digest is available:

   a) Click the Email Digest switch.

      The email digest is enabled when the switch is green and disabled when the switch is grey.

   b) If you enabled the digest, select the Interval (length of time) during which the notifications are accumulated.
The interval begins with the first occurrence of notification activity during the specified interval. For example, if you selected the Daily interval and the first notification occurs at 07:00, the system begins accumulating notifications at 07:00 and stops at 07:00 the next day. Soon after the interval ends, the system sends the email digest instead of sending the individual notifications that were triggered during the digest interval. If you disabled the digest, the system immediately stops accumulating the notifications and does not send the email digest.

4. To enable or disable a channel on which the notification is received, click the switch for the channel. The notification is enabled when the switch is green and disabled when the switch is grey. If you previously disabled an entire channel, you cannot enable that channel for the notification.

5. To set more criteria for notification delivery, click the row or the right arrow (>) next to the channel for the notification.

   a) Complete the Apply Conditions form (see table).
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schedule</td>
<td>Select a schedule that determines when the notification can and cannot be received.</td>
</tr>
<tr>
<td>Filter</td>
<td>Select a pre-configured filter with the criteria that determines when the notification can be sent. For example, you might select a filter whose conditions send notifications when an incident with a priority of 1 - Critical is opened for a network issue.</td>
</tr>
</tbody>
</table>
Create personal notifications

You can create personal notifications, which are subscriptions to notifications of importance to you. You can apply conditions that control specific content included in your personal notification, and also enable or disable the channels for delivery.

Role required: user

A personal notification is a subscribable notification that you can customize. You can assign the notification a name that is meaningful to you and filter the information received in that notification.

1. Click the gear icon in the banner frame to open the System Settings window, and click the Notifications tab.
2. Click Create Personal Notification.
3. Complete the New Personal Notification form (see table).

### Field Table

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced filter</td>
<td>Select this check box to use the condition builder to create additional criteria. When you select the check box, the Table and Conditions fields are displayed.</td>
</tr>
<tr>
<td>Table</td>
<td>Select the table for the notification. For example, if you selected an incident-related notification, you might select the Incident [incident] table.</td>
</tr>
<tr>
<td>Conditions</td>
<td>Define as many conditions as needed to limit the notifications you receive. For example, you can choose to be notified only when an incident communication plan is created for a specific configuration item.</td>
</tr>
</tbody>
</table>

b) Click Save.

To navigate back, click the left arrow (<) at the top of the Notifications window.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>A descriptive name for your personal notification. Use a meaningful name to distinguish it from system notifications.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Notification</td>
<td>The notification to subscribe to. You can subscribe only to notifications that are configured to allow subscriptions. Depending on the notification you select, the Table, Affected record, and Send when fields are displayed.</td>
</tr>
<tr>
<td>Table</td>
<td>The database table that the notification is linked to.</td>
</tr>
<tr>
<td>Affected record</td>
<td>The specific record that the notification is based on. Click the lookup icon, select the table and specific document (record) in that table, and click OK.</td>
</tr>
<tr>
<td>Send when</td>
<td>Another condition that must be met to send the notification. For example, you might create a filter whose conditions send notifications when an incident with a priority of 1 - Critical is opened for a network issue.</td>
</tr>
</tbody>
</table>

4. Click Save. The system creates the personal notification and adds it to the appropriate notification category.

In the following example, notice the category in which the system placed the personal notification.
5. Enable or disable the channels for your personal notification.
6. Navigate back to the list of notifications for the category by clicking the left back arrow (←) at the top of the form.
   Notice that your Personal Notifications are listed above the System Notifications in the given category.
7. Navigate back by clicking the left back arrow («) at the top of the form or by clicking the Notifications tab.

User notification preferences in UI15 and earlier

In UI15 and earlier interfaces, use the Notification Preferences link in the User form to manage the notifications that you can subscribe to.

The following instructions explain how to use Notification Preferences to manage notifications.

Set up a notification device in UI15 and earlier

You can add devices for a user to receive notifications. A device is a mobile device, email account, or voice message system that the user has access to.
Role required: admin

Notification devices include email addresses, service providers for SMS messages, and mobile applications.

1. Navigate to User Administration Users.
2. Select a user.
3. Click Notification Preferences.
4. Click Create New Device.
5. Fill in the fields on the form (see table).
6. Click Submit.

### Table 165: New Device form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>A descriptive name of the device or account.</td>
</tr>
<tr>
<td>Type</td>
<td>The type of device:</td>
</tr>
<tr>
<td></td>
<td>• Email: for email messages.</td>
</tr>
<tr>
<td></td>
<td>• SMS: for SMS messages.</td>
</tr>
<tr>
<td></td>
<td>• Mobile: for push notifications.</td>
</tr>
<tr>
<td>Email address</td>
<td>The user's email address.</td>
</tr>
<tr>
<td>Mobile application</td>
<td>The mobile application for push notifications.</td>
</tr>
<tr>
<td>Phone number</td>
<td>The user's phone number for SMS messages.</td>
</tr>
<tr>
<td>Service provider</td>
<td>The service provider for SMS messages.</td>
</tr>
<tr>
<td>User</td>
<td>The user's record in the system.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Order</td>
<td>A number that determines which device receives the notification when multiple devices are configured. The device with the lowest number receives the notification.</td>
</tr>
<tr>
<td>Active</td>
<td>A flag that indicates if the device is active.</td>
</tr>
<tr>
<td>Related list</td>
<td></td>
</tr>
<tr>
<td>Notification Device Variables</td>
<td>Additional, optional attributes of an SMS device used inside an advanced script from the SMS service provider. These attributes are generally used to deliver SMS notifications to an internal SMS distribution technology. This advanced scripting procedure is not necessary for configuring external SMS providers.</td>
</tr>
</tbody>
</table>

**Note:** If you inactivate a device, it still appears in the user preferences, but the switches that allow users to select the notifications are grayed out for that device column.

*Edit a notification device in UI15 and earlier*

All users can edit their notification preferences, including notification devices.

Role required: any user

1. Navigate to Self-Service My Profile.
2. Click Notification Preferences.
3. Click the name of the existing device.

The device form opens allowing you to make certain modifications, depending on your user role. See *Set up a notification device in UI15 and earlier* on page 836 for a description of all fields.

*Add personal subscriptions in UI15 and earlier*

After setting up your devices, you can subscribe to notifications that are configured as subscribable.

The Subscription Based Notifications 2.0 plugin must be active.

If you have subscribed to messages, your list of notification messages can build over time. You can create preferences for how and when these messages are delivered, or unsubscribe to messages that are not configured as mandatory.

**Note:** Conditions that you apply to personal subscriptions do not override the filters that the administrator creates for the subscribable notifications. Your conditions are evaluated after the
conditions on the subscribable notification are met. If the notification filter set by the administrator fails, the filter conditions on your personal subscription are not evaluated.

1. Navigate to Self-Service My Profile to open your user profile.
2. Click the Notification Preferences related link.
   The Notification Preferences page opens. You can see your personal subscriptions and the general notifications that you are subscribed to.
3. Click Subscriptions.
4. Click Add Personal Subscriptions.
5. Fill in the fields as described in the table.

### Add Personal Subscription

- **Name**: CI Affected
- **Table**: Incident [incident]
- **Send to**: (element)
- **Send when**: Add Filter Condition
  - Choose field:
  - Oper:
  - Value:
- **Notification**: CI affected
- **Active**: Check box indicating whether the subscription is active. Users can receive notifications for subscriptions only if the subscription is active. If it is not active, the on-off switch for the subscription is set to off and is read-only.

**Figure 191: Add personal subscriptions**

**Table 166:**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>A descriptive name for the subscription.</td>
</tr>
<tr>
<td>Notification</td>
<td>The notification to subscribe to. You can only subscribe to notifications that are configured to allow subscriptions.</td>
</tr>
<tr>
<td>Table</td>
<td>The table that the incident is configured to run on. You cannot modify the table from this form. To select another table, configure the notification. See <a href="#">Create an email notification</a> on page 649.</td>
</tr>
<tr>
<td>Active</td>
<td>Check box indicating whether the subscription is active. Users can receive notifications for subscriptions only if the subscription is active. If it is not active, the on-off switch for the subscription is set to off and is read-only.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Send to</td>
<td>The devices that this subscription is sent to. Selecting the devices in this field is the same as turning on the switch for the subscription on the Subscriptions page.</td>
</tr>
<tr>
<td>Affected record</td>
<td>The specific record that the subscription is based on. Click the lookup icon, and then select the table and the specific record in that table.</td>
</tr>
<tr>
<td>Send when</td>
<td>Another condition that must be met to send the notification. For example, you might select a filter whose conditions send notifications when an incident with a priority of 1 - Critical is opened for a network issue. The system evaluates the conditions in this filter after the conditions set in the notification filter by the administrator.</td>
</tr>
</tbody>
</table>

6. Click Submit.
7. You can turn the subscription for active subscribable notifications on or off using the switch on the Subscriptions management section of the Notification Preferences page.

![Subscription](Image)

**Figure 192: Personal subscriptions**

Personal subscriptions are saved in the Notification Subscriptions [sys_notif_subscription] table. The records in this table are made active or inactive when you slick the switch to subscribe or unsubscribe from the notification.

8. You can edit the subscription at any time by clicking Edit next to it.

**Select notifications in UI15 and earlier**

Administrators can configure notification preferences for each user and users can also select which notifications they want to receive for various devices.

1. Navigate to Self-Service My Profile to select your own notifications, or if you have admin access, navigate to User Administration Users to select notifications for another user.
2. Click a user record to open it.
3. On the User form, click Notification Preferences under Related Links.

   The notification preferences page appears. The preferences pages show all the notifications available to the user and the devices that the user has configured, such as email or mobile phone. If a user does not have read access to the table on which the notification is based, the notification does not appear.

   Every user has the Primary email device, where subscriptions to email notifications can be enabled.
4. Click the switch next to the notification to subscribe the user to it.

Modify notifications for a user device in UI15 and earlier

After you set up the devices through which users receive notifications, you can assign the notifications to each device and add advanced conditions to limit what notifications are received.

Role required: admin

1. On the Notification Preferences page for a user, find the notification from the list of notifications.
2. Click Edit next to the notification. The preferences for that notification appear.
3. Fill in the fields on the form (see table).
4. Click Submit.
Notification Preferences allow users to prevent notifications from being sent to them with Filters and Schedules. Schedule allows users to only have notifications sent to them when generated within a specific schedule. Filters give the ability to prevent notifications from being sent with pre-defined filters. Advanced Filter allows definition of a custom filter.

### Table 167: Form fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notification Message</td>
<td>Select the notification. Related fields appear for certain notifications. For example, if you select CI affected or Location affected, a field appears for selecting the CI or the location. Duplicate messages are not permitted on a device.</td>
</tr>
<tr>
<td>Device</td>
<td>Modify the device if necessary.</td>
</tr>
<tr>
<td>Schedule</td>
<td>Select a schedule that determines when the notification can and cannot be received.</td>
</tr>
</tbody>
</table>

Figure 194: Notification preferences for a user's device
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filter</td>
<td>Select a pre-configured filter with the criteria that determines when the notification can be sent. For example, you might select a filter whose conditions send notifications when an incident with a priority of 1 - Critical is opened for a network issue. The system evaluates the conditions in this filter after the conditions in the notification filter set by the administrator. This field is not available when an advanced filter is configured.</td>
</tr>
<tr>
<td>Advanced filter</td>
<td>Select this option if you want to use the condition builder to create additional criteria. When you select the check box, the Table and Conditions fields replace the Filter field.</td>
</tr>
<tr>
<td>Table</td>
<td>Select the table for the notification. For example, if you select the CI affected notification message, you might select the Incident [incident] or Change Request [change_request] table. This field appears when you check the Advanced filter check box.</td>
</tr>
<tr>
<td>Conditions</td>
<td>Define as many conditions as needed to limit the notifications you receive.</td>
</tr>
</tbody>
</table>

Create a service provider

Administrators can configure service providers for devices that use SMS.

Role required: admin

Administrators also have the option of configuring how a device’s service provider affects the construction of the device's email address.

1. Navigate to the Notification Service Provider [cmn_notif_service_provider] table by typing cmn_notif_service_provider.list in the application navigator filter.
2. Fill out or change the fields on the form (see table).
3. Click Update.
4. Click Save on the Notification Preferences page.
### Table 168: The Notification Service Provider form fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Configured name of the service provider.</td>
</tr>
<tr>
<td>Type</td>
<td>Type of device, in this case SMS.</td>
</tr>
<tr>
<td>Active</td>
<td>Enables or disables this notification device.</td>
</tr>
<tr>
<td>Advanced notification</td>
<td>Removes all the previous options and displays the Advanced script field.</td>
</tr>
<tr>
<td>Advanced script</td>
<td>Used for custom notifications that run a script rather than construct a traditional SMS/email. This is generally used when all outbound SMS messages must run through a central SMS hub, as opposed to being sent directly from the instance to the SMS provider. Advanced users can construct a script in this field that will send a notification to an old style numeric pager that cannot receive SMS communications. This field is rarely used and employs advanced scripts. Contact your representative to assist you with any advanced SMS scripting.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Construct address manually</td>
<td>Removes the prefix and suffix options and displays the Construction script field.</td>
</tr>
<tr>
<td>Construction script</td>
<td>Allows you to script the email address construction as you would in a business rule. For example, abc + current.phone_number + <a href="mailto:def@text.att.net">def@text.att.net</a> would construct an email address of <a href="mailto:abc2223344444def@text.att.net">abc2223344444def@text.att.net</a>.</td>
</tr>
<tr>
<td></td>
<td>NOTE: Current is a reference to the device, not the service provider, hence the current.phone_number variable that uses the device's phone_number value.</td>
</tr>
<tr>
<td>SMS Provider Email Prefix</td>
<td>Places the provided text before the device's specified phone number; for example: <a href="mailto:PREFIX2223344444@text.att.net">PREFIX2223344444@text.att.net</a>.</td>
</tr>
<tr>
<td>SMS Provider Email Suffix</td>
<td>Places the provided text after '@' sign; for example: 2223344444@SUFFIX.</td>
</tr>
<tr>
<td>Notification Device Variables</td>
<td>Additional, optional attributes of an SMS device used inside an SMS service provider's Advanced script. This is generally used to deliver SMS notifications to an internal SMS distribution technology. This is an advanced scripting procedure and is not necessary for configuring external SMS providers.</td>
</tr>
</tbody>
</table>

Select a service provider

You can configure how a device's service provider affects the construction of the device's email address.

Role required: admin

1. Navigate to User Administration Users and open any user's record.
2. Under Related Links, click Notification Preferences, and then click an SMS notification device.
3. If no SMS device is present, click New Device and configure one.
4. Select the appropriate service provider, and then click the reference icon for the Service provider field. The service providers are saved in the Notification Service Provider [cmn_notif_service_provider] table. Only active providers are visible.

SMS notification advanced scripting

You can use these objects and their attributes in your advanced notification scripts on the SMS Notification Service Provider form.
Table 169: Objects and attributes

<table>
<thead>
<tr>
<th>Object</th>
<th>Example attributes</th>
</tr>
</thead>
</table>
| current | • current.number  
            • current.assigned_to  
            • current.company  
            • current.state |
| email   | • email.notify  
            • email.sourceTable  
            • email.contentType  
            • email.attachments  
            • email.HTML  
            • email.dataVersionHeader  
            • email.UID  
            • email.allowSavingNoRecipientEmail  
            • email.recipients  
            • email.ignore  
            • email.save  
            • email.headers  
            • email.sysID  
            • email.attachmentLimits  
            • email.class  
            • email.sysId  
            • email.textBody  
            • email.hashCode  
            • email.weight  
            • email.equals  
            • email.logEmail  
            • email.reset  
            • email.wait  
            • email.body  
            • email.SMSText  
            • email.watermark  
            • email.textBodyLegacy  
            • email.sourceHeader  
            • email.instance  
            • email.importance |
### Make a notification mandatory

To prevent users from turning off or deleting a subscription to a notification, make the notification mandatory.

**Role required:** admin

1. Navigate to System Notification Email Notifications.
2. Open the appropriate notification.
3. Configure the form and add the Mandatory field. This field does not display by default.
   a) Click the context menu icon ( ) and select Configure Form Layout.
   b) Using the slushbucket, select the Mandatory field and the order in which you want the field to appear.
   c) Click Save.
4. Select the Mandatory check box.

That notification is locked in user notification preferences, preventing the user from removing or unsubscribing to the notification, filtering it, or changing the schedule. In the user's notification preferences, the control button for the mandatory notification is on and is read only.

<table>
<thead>
<tr>
<th>Object</th>
<th>Example attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>device</td>
<td>• device.service_provider</td>
</tr>
<tr>
<td></td>
<td>• device.group</td>
</tr>
<tr>
<td></td>
<td>• device.order</td>
</tr>
<tr>
<td></td>
<td>• device.sys_id</td>
</tr>
<tr>
<td></td>
<td>• device.sys_updated_by</td>
</tr>
<tr>
<td></td>
<td>• device.sys_created_by</td>
</tr>
<tr>
<td></td>
<td>• device.primary_email</td>
</tr>
<tr>
<td></td>
<td>• device.schedule</td>
</tr>
<tr>
<td></td>
<td>• device.name</td>
</tr>
<tr>
<td></td>
<td>• device.sys_created_on</td>
</tr>
<tr>
<td></td>
<td>• device.email_address</td>
</tr>
<tr>
<td></td>
<td>• device.active</td>
</tr>
<tr>
<td></td>
<td>• device.phone_number</td>
</tr>
<tr>
<td></td>
<td>• device.sys_mod_count</td>
</tr>
<tr>
<td></td>
<td>• device.sys_updated_on</td>
</tr>
<tr>
<td></td>
<td>• device.user</td>
</tr>
<tr>
<td></td>
<td>• device.sys_meta</td>
</tr>
<tr>
<td></td>
<td>• device.type</td>
</tr>
</tbody>
</table>
Force a notification to be sent

To force a notification to be sent to the specified users, enable forced delivery.

Role required: admin

Forcing a notification means that the relevant users receive the notification, even if they have not subscribed to the notification or have turned off the subscription. In addition, the users receive the notification even if the Notification field is set to Disable.

1. Navigate to System Notification Email Notifications.
2. Open the appropriate notification.
3. Configure the form and add the Force delivery field.
4. Select the Force delivery check box.
5. Click Update.

Unlike using the Mandatory option, forcing the delivery does not lock the user's preference or prevent the user from unsubscribing from the notification.

Create a notification filter

Notification filters enable a user to control the delivery of messages by creating special conditions on multiple tables in a single, reusable filter.

Role required: admin

For example, you can create a filter that controls message delivery when active incidents, problems, and change requests for network issues reach a critical state. For UI15 and earlier interfaces, notification filters are available for selection in the Filter field of a user's Notification Preferences form. For UI16, filters for
notifications or channels are set through the Notifications tab of the System Settings window. For details, see Apply notification conditions on page 829.

**Note:** The system applies the user's filter conditions after the administrator's conditions have been evaluated. If the administrator's conditions fail, the system ignores notification filters.

1. Navigate to System Notification Email Notification Filters and create a record.
2. In the Notification conditions related list of the new record, create and submit filter conditions on one or more tables.

3. Repeat the procedure to create additional conditions on other tables for this filter.

---

**Filter device notifications using a schedule**

You can associate devices, such as Email, SMS, and Voice, to schedules that define when the devices can and cannot receive notifications.

Role required: admin
Notifications that are triggered outside of the scheduled days and times for the device are not queued up for delivery at a later time. For example, if an administrator selects the Weekdays schedule for an email device, the device receives email notifications triggered between Monday and Friday. If notifications are triggered on Saturday, they are not delivered to the device.

1. Define schedules as needed using System Scheduler Schedules Schedules.
2. Add or edit a device.
3. Configure the New Device for System Administrator form and add the Schedule field.
4. In the Schedule field, select the schedule for the device.
5. Click Submit.

Edit the schedule or filter of an existing notification message

You can update a schedule or filter that was previously created for an email notification.

Role required: admin

To edit the schedule or filter of an existing notification message:

1. In the Notification Preferences screen, click the message to edit.
   You cannot edit any attributes of a mandatory message.
2. Make the appropriate changes in the form.
3. Click Update.

Email unsubscribe

Administrators can add unsubscribe links to notifications so that users can stop receiving particular email messages.

**Note:** The base system notifications include unsubscribe and notification preferences links.

The system offers two types of macros to create unsubscribe links.

- An unsubscribe link that creates an email message to the instance.
- An unsubscribe link that opens the notification preferences for the user on the instance.

<table>
<thead>
<tr>
<th>Unsubscribe type</th>
<th>Macro used</th>
<th>Description</th>
<th>Available parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unsubscribe by email (Unauthenticated)</td>
<td>${NOTIF_UNSUB}</td>
<td>The system generates an HTML mailto hyperlink. When users click the link, their browser or email client creates a pre-formatted unsubscribe email message to the instance.</td>
<td>link_text: specify the text to display as a link within quotation marks.</td>
</tr>
<tr>
<td>Unsubscribe type</td>
<td>Macro used</td>
<td>Description</td>
<td>Available parameters</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>-----------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Unsubscribe by notification preferences (Authenticated)</td>
<td>$(NOTIF_PREFS)</td>
<td>The system generates an instance link directly to the notification preferences for this notification type.</td>
<td>link_text: specify the text to display as a link within quotation marks.</td>
</tr>
</tbody>
</table>

Administrators can add unsubscribe macros to any notification record type such as:

- Email layouts
- Email templates
- Email notifications

**Unsubscribe by email**

Unsubscribe by email requires the user email client or browser to create a pre-formatted email message containing these elements:

- The To field has the email address of the instance.
- The Subject starts with the string Unsubscribe from.
- The Body has a JSON string with a name-value pair of Unsubscribe and an array value that contains two more name-value pairs.
  - The notification_id parameter specifies the Sys ID of the notification the user wants to unsubscribe from.
  - The unsub_token parameter specifies an instance ID the system uses to verify that the email came from a ServiceNow instance.

**Note:** Some email clients and web browsers, such as GMail on Chrome, require extra client configuration to support mailto hyperlinks. Administrators can provide an alternative unsubscribe method for users whose email client or browser does not support mailto links. See RFC6068 for information about the mailto URI scheme.

The Unsubscribe from Notification inbound action processes the email and unsubscribes the sender from the listed notification.

**Note:** Unsubscribing by email message does not require users to authenticate with the instance first.

**Unsubscribe by notification preferences**

Unsubscribe by notification preferences requires the user’s browser to navigate to the notification preferences page on the instance. After logging in, the system displays the notification preferences for this particular notification.

Users can set preferences for this notification such as disabling notifications for a particular device. Users must save their notification preferences for changes to take effect.

**Unsubscribe links**

This email layout adds several unsubscribe links to the bottom of each email notification.
${NOTIF_UNSUB} from this notification by email or ${NOTIF_UNSUB +link_text="click here"}.

Manage your ${NOTIF_PREFS} or ${NOTIF_PREFS+link_text="click here"}.

When rendered in an email notification, the unsubscribe links only display the link text.
Figure 195: Sample email with unsubscribe links

If a user clicks the Unsubscribe link, the email client creates a message such as this:
Notifications in messaging applications

Enable users to receive their ServiceNow platform notifications in Slack or Microsoft Teams messaging applications. Use the Now Actions app to configure the messaging apps for your instance.

Admin setup

To enable ServiceNow notifications within Slack or Teams, you must be an administrator for both ServiceNow and the third-party application.

1. Request IntegrationHub

   Integrations with third-party systems require a separate IntegrationHub subscription. To activate IntegrationHub, see Request IntegrationHub on page 1329.

2. Request the Messaging Notification plugin

   To activate this feature, request the Messaging Notification plugin (com.glide.notification.messaging) through the HI
Customer Service system. This plugin activates related plugins if they are not already active.

3. Install the Now Actions messaging app for Slack or Teams

As an administrator for both ServiceNow and the third-party application, find and install the Now Actions app. Install the application in ServiceNow to associate the app with your instance.

**Note:** The primary owner of a Slack workspace or organization owns and manages the application. To avoid losing admin access to the workspace or organization, transfer primary ownership before any administration changes occur. If you transfer primary ownership, update the JSON payload for the Slack installation in the Notification Integration page. For more information about editing the Slack installation, see [Install the Now Actions messaging app](#) on page 857.

If the Now Actions app is uninstalled, the workspace or team displays as inactive in the Notification Integration page.

4. Configure message content

Create a message in the Message Contents [messaging_content] table that you can use in multiple notifications. Messages can be informative, or they can request action from an individual Slack or Teams user. For example, the Approval Request message includes Approve and Reject buttons to take the associated action in ServiceNow. Only users that have linked their Slack or Teams account with their ServiceNow account can take action in ServiceNow from the third-party application.

5. Create a messaging notification

Notifications define when a message is sent, who it is sent to, and what it contains. To send a notification to Slack or Teams, add a messaging content record to the notification and configure the notification messaging channel. Notifications that require action must be sent to individual users instead of groups.

**User setup**

To enable individual ServiceNow notifications in Slack or Teams, and to take action on notifications, configure your system settings and link your user accounts.

**Link your ServiceNow user account to your Slack or Teams account**

Link your ServiceNow account to your Slack or Teams account to take action on ServiceNow notifications from within Slack or Teams. If you do not link accounts, you can still receive notifications within group channels. However, you cannot
approve ServiceNow requests or take action on notifications from within Slack or Teams.

Configure system settings

Each user can enable ServiceNow notifications in a third-party application by configuring the communication channel in their system settings. Opt in to receive approval requests and other actionable notifications in third-party channels.

Notification channels

In ServiceNow, a notification channel is a method or device for receiving notifications. For example, in the base system you can elect to receive notifications through email or SMS channels. If messaging applications are enabled on your instance, you can enable notifications to Slack and Teams using Notification Channels in your system settings.

Actions and events

The Message Actions [messaging_observer_handler] table processes communication channel events, such as adding or deleting a Slack channel, to keep the instance and the third-party application in sync. Only developers creating Slack or Teams applications should add actions to this table. Register new actions with the instance through the Message Event Registry [messaging_observable] table. To remove a base system action, clear the active flag instead of deleting the record.

Logging

The Inbound and Outbound message logs contain information on actions, events, and activities between ServiceNow and the third-party application. Use the logs to identify the content, state, and origin of communications to and from your instance.

Request the Messaging Notification plugin

To activate this feature, request the Messaging Notification plugin (com.glide.notification.messaging) through the HI Customer Service system. This plugin activates related plugins if they are not already active.

Role required: none

1. In the HI Service Portal, click Service Requests Activate Plugin.
2. Fill out the form.

<table>
<thead>
<tr>
<th>Target Instance</th>
<th>Instance on which to activate the plugin.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plugin Name</td>
<td>Name of the plugin to activate.</td>
</tr>
</tbody>
</table>
Specify the date and time you would like this plugin to be enabled

Date and time must be at least 2 business days from the current time.

**Note:** Plugins are activated in two batches each business day in the Pacific time zone, once in the morning and once in the evening. If the plugin must be activated at a specific time, enter the request in the Reason/Comments.

| Reason/Comments | Provide any information that would be helpful for the ServiceNow personnel activating the plugin. For example, if you need the plugin activated at a specific time instead of during one of the default activation windows. |

3. Click Submit.

### Install the Now Actions messaging app

As an administrator for both ServiceNow and the third-party application, find and install the Now Actions app. Install the application in ServiceNow to associate the app with your instance.

**Roles required:**
- Admin or messaging_admin in ServiceNow
- Administrator for Slack or Teams

### Install the Now Actions messaging app for Slack

Install the Now Actions messaging app from the Slack App Directory and associate the app with your instance.

1. Install the Now Actions app from the Slack App Directory.
   a) Find and install the Now Actions app in the Slack App Directory.
   b) Click Authorize when prompted.
   c) Enter a customized name, app description, and icon (optional).
   d) Configure your Now Actions web address. This is the base URL for your instance. For example, https://<instance_name>.service-now.com/.
   e) Copy the JSON configuration found in the Add your Slack credentials to your app section for use in later steps.

2. Associate your Slack app with your instance.
   a) Navigate to System Notification # Messaging Integration Configuration.
   b) Click the Install button next to Slack.
   c) In the JSON Configuration pop-up, paste in the JSON configuration you copied in earlier steps.

3. Check for installation verification. The Slack workspace should appear below the Slack heading on the Notification Integration page.
During installation, the instance synchronizes with all public Slack channels in the workspace. New public channels added after installation will automatically synchronize with the instance. You can browse to System Notification Messaging Channels on your instance to verify that the new channel appears on the instance.

To update the app after installation, use the Configure JSON Payload and Settings on Slack icons on the Notification Integration page. You can view the JSON payload, view app credentials, change app appearance, or delete the app.

Install the Now Actions messaging app for Microsoft Teams

Associate the Now Actions messaging app with your instance.

1. Associate your Microsoft Teams app with your instance.
   a) Navigate to System Notification # Messaging Integration Configuration.
   b) Click the Install button next to Microsoft Teams.
   c) A pop-up message appears to confirm redirection to Microsoft Teams to verify your identity. Click OK.
   d) When prompted, log in to Microsoft Teams with your Teams admin account.
   e) Click Accept to accept the permissions for the app.
f) If the selected workspace has already been assigned, you are asked whether you want to proceed to overwrite the previous assignment. Click Override to change the workspace, or click Cancel to leave the current assignment in place.

g) After authentication, installation will start in the background. Once installation completes, a message appears confirming the installation.
h) Click the app package link to access a knowledge base article KB0690098, containing the application package for Microsoft Teams. Follow the steps in the article to make this package available for your Microsoft Teams users.

2. Check for installation verification. The new team should appear below the Teams heading on the Notification Integration page.
During installation, the instance synchronizes with all public Teams channels. To add channels created after the install, open Microsoft Teams and @mention the app from the new channel. You can browse to System Notification Messaging Channels on your instance to verify that the new channel appears on the instance.

To receive a ServiceNow notification in Microsoft Teams, create a message and a notification. See Configure message content on page 861 and Create a messaging notification on page 863.

**Configure message content**

Create a message in the Message Contents [messaging_content] table that you can use in multiple notifications. Messages can be informative, or they can request action from an individual Slack or Teams user. For example, the Approval Request message includes Approve and Reject buttons to take the associated action in ServiceNow.

**Role required: admin or messaging_admin**

To enable users to take actions in Slack or Teams, use the Buttons message type and define scripted behavior. Only users that have linked their Slack or Teams account with their ServiceNow account can take action in ServiceNow from the third-party application.

1. Navigate to System Notification Messaging Content.
2. Open an existing notification record or click New to create a new record.
3. Fill in or modify the fields as appropriate.

<table>
<thead>
<tr>
<th>Table 171: Messaging content fields</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Field</strong></td>
</tr>
<tr>
<td>Name</td>
</tr>
<tr>
<td>Type</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Target table</td>
</tr>
<tr>
<td><strong>Note:</strong> Notifications running on the Task [task] table are not supported. Instead, use a table extended from task.</td>
</tr>
<tr>
<td>Fields</td>
</tr>
<tr>
<td>Message heading</td>
</tr>
<tr>
<td>Message</td>
</tr>
<tr>
<td>Field</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>Buttons</td>
</tr>
<tr>
<td>Script</td>
</tr>
</tbody>
</table>

```java
if (actions.get('button') == 'Approve') {
    target.state = 'approved';
    target.update();
}
```

In this example, the script conditionally executes when the "Approve" button is selected. Use the method sn_notification.Messaging.send to send information to the messaging window.

```java
var content = new GlideRecord("messaging_content");
content.get("1bb10839572213007f004758ef94f9c4");
sn_notification.Messaging.send(application, userId, content, target);
```

In this example, the script stores a Message Content record in the content variable. It then posts a message from that Message Content record.

| Application | Select the application scope for this notification. |

4. Click Submit

This example shows the output of a message in Microsoft Teams. This message is of the buttons type, which shows buttons and performs scripted actions based on the user selection. In this case, the script uses the sn_notification.Messaging.send method to display the change in state for the record.
Use the message in a notification. For more information about creating notifications, see *Create a messaging notification* on page 863.

Create a messaging notification

Notifications define when a message is sent, who it is sent to, and what it contains. To send a notification to Slack or Teams, add a messaging content record to the notification and configure the notification messaging channel. Notifications that require action must be sent to individual users instead of groups.

Role required: admin

1. Navigate to System Notification Messaging Notifications.
2. Click New.
3. Fill in or modify the fields as appropriate.
Use Notifications to notify users about specific activities in ServiceNow, such as updates to incidents or change requests. Notifications allow administrators to specify when to send the notification, who receives the notification, and what content is in the notification.

Table 172: Messaging notification fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a unique name for the notification. Use descriptive names to ensure that your users are able to easily distinguish between notifications.</td>
</tr>
<tr>
<td>Table</td>
<td>Select a table to trigger the message. Must be a table or database view within the same application scope.</td>
</tr>
<tr>
<td>Category</td>
<td>Select a category for the notification. A category groups related notifications in the system settings.</td>
</tr>
<tr>
<td>Description</td>
<td>Enter a description for this notification.</td>
</tr>
</tbody>
</table>

**Note:** Notifications running on the task [task] table are not supported. Instead, use a table extended from task.

**Note:** Do not leave the category as Uncategorised, as users may not be able to find the notification in their list of notifications.
**Note:** Notification records are shared between messaging, email, and push notifications. Some fields on the form are not relevant to messaging notification records. Leave fields not described here at their default values.

4. Click Advanced view under Related links to switch the advanced view. Switching to the Advanced view saves the current record.

5. Open the When to send tab and complete the form.

![Notification form](image)

**Note:** If the same trigger generates multiple notifications, the system only sends one notification. The system considers all other notifications, even if they have a different subject and body, as duplicates. The Ignore Duplicates business rule controls this functionality.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Send when</td>
<td>Select under what condition the notification is sent:</td>
</tr>
<tr>
<td></td>
<td>• When a record is inserted or updated</td>
</tr>
<tr>
<td></td>
<td>• When a particular event is fired</td>
</tr>
<tr>
<td></td>
<td>• When triggered as an action step in Flow Designer</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Weight</td>
<td>Set a numerical value for the notification priority relative to other notifications with the same target table and recipients. The system only sends the notification with the highest weight. The default value 0 causes the system to always send the notification (assuming the conditions are met).</td>
</tr>
<tr>
<td>Conditions</td>
<td>Use the condition builder to select the conditions under which this notification is sent. For example, select Priority greater than 3 - Moderate to send the notification only for High and Critical priority incidents.</td>
</tr>
<tr>
<td>Inserted</td>
<td>Select the check box to enable messaging notification when a record is inserted. This field appears when you set the Send when field to Record inserted or updated.</td>
</tr>
<tr>
<td>Updated</td>
<td>Select the check box to enable messaging notification when a record is updated. This field appears when you set the Send when field to Record inserted or updated.</td>
</tr>
<tr>
<td>Event name</td>
<td>Select the event that triggers this notification. This field appears when you set the Send when field to Event is fired.</td>
</tr>
</tbody>
</table>
| Advanced condition | Create a script to define more filter conditions, like sending a notification based on the current messaging record, changing field values, or changing system properties.  

*The advanced condition* script must return true or set a global answer variable to true to send the notification. 

The advanced condition script uses the following global variables:  
• current: Contains the current record from the table to which the notification is linked.  
• event: Contains the event that triggered the notification.  

**Note:** The Advanced condition field is evaluated in addition to other conditions you set on the notification. Both the condition and advanced condition must evaluate to true to send the notification.

6. Open the Who will receive tab and fill in or modify the following fields.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Messaging Channels</td>
<td>Select the messaging channels to receive the messaging notification. Only complete this field if creating a simple notification to send to a channel. Simple notifications use a Messaging Content record of Type Simple.</td>
</tr>
<tr>
<td>Users</td>
<td>Select the users you want to receive the messaging notification. Only complete this field if creating a notification that requires user action. Notifications that require user action use a Messaging Content record of Type Buttons.</td>
</tr>
<tr>
<td>Users/groups in fields</td>
<td>Select users or groups from reference fields. For example, if a notification uses the Incident [incident] table, you can select users or groups from incident fields like Opened by and Assignment group.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> You can dot-walk to values in reference fields by clicking the plus sign in the field selector and then selecting the related field.</td>
</tr>
<tr>
<td></td>
<td>If you address the notification to a user with an inactive record in the User [sys_user] table, the system does not send the notification to that user.</td>
</tr>
<tr>
<td>Groups</td>
<td>Select the groups you want to receive the messaging notification. You can search for groups with the reference lookup icon or by manually entering the group name. This list of groups is static.</td>
</tr>
<tr>
<td>Send to event creator</td>
<td>Select this check box to send the notification to the person who performed the action that started the notification process if the person is also a recipient. If the event creator is not specified in one of the recipient fields, the event creator does not receive a notification, regardless of the setting in this field. For new notifications, this option is selected by default.</td>
</tr>
<tr>
<td>Event parm 1 contains recipient</td>
<td>Select this check box if the event parameter 1 contains one or more notification recipients (in a comma separated-list). This field is visible only when the Send when field is set to Event is fired.</td>
</tr>
</tbody>
</table>
7. Open the What it will contain tab and fill in or modify the following fields.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Event parm 2 contains recipient</td>
<td>Select this check box if the event parameter 2 contains one or more notification recipients (in a comma-separated list). This field is visible only when the Send when field is set to Event is fired.</td>
</tr>
</tbody>
</table>

8. Click Update.

**Link your ServiceNow user account to your Slack or MS Teams account for Now Actions**

Link your ServiceNow account to your Slack or Teams account to take action on ServiceNow notifications from within Slack or Teams. If you do not link accounts, you can still receive notifications within group channels. However, you cannot approve ServiceNow requests or take action on notifications from within Slack or Teams.

Role required: user

1. Open the Slack or Teams application
2. Find the Now Actions bot. This bot is found in the left panel of Slack under Apps, and in the left panel of Teams in the Chat tab.
3. Start a conversation with the Now Actions bot. The bot then presents a link to authenticate.

![Authentication message](image)

**Figure 197: Authentication message**

4. Click the Connect to ServiceNow link.
A new browser tab opens and prompts the user to Deny or Confirm the connection between your Slack or Teams account and your ServiceNow account. This link will expire five minutes after it is displayed.

5. Click Confirm to link the accounts.

6. After confirmation, you are directed to the instance user record. A confirmation message is displayed at the top of the screen.

Configure system settings

Each user can enable ServiceNow notifications in a third-party application by configuring the communication channel in their system settings. Opt in to receive approval requests and other actionable notifications in third-party channels.

You can only enable notifications in notification channels you have permission to access.

1. Select the gear icon in the banner frame to access the System Settings window.
2. Select the Notifications tab.
3. Under Notification Channels, enable notifications for the desired channels.
4. Opt in to individual notifications. You must opt in for each individual notification you wish to receive. For example, to receive an approval request as a direct message in Slack, you must find the notification and set the Slack workspace as an enabled channel for that specific notification.
   a) In the Notifications by Category section, select the category containing the notification you want to enable. The category is defined on the notification record.

   **Note:** You can also search notifications to find individual notifications by name.

   b) Select the notification you wish to enable a channel for.

   c) Enable the notification channels where you want to receive this notification.

Unlink your ServiceNow user account from your Slack or MS Teams account for Now Actions

Unlink your Slack account from your Slack or MS Teams account to stop receiving actionable ServiceNow notifications in Slack or Teams.

**Role required:** user

If you unlink your account to a messaging app for Now Actions, you must also disable the corresponding messaging channel in your notification preferences.

1. Navigate to Self-Service My Profile.
2. Click the View Linked Accounts related link.
3. In the Linked Accounts page, check the selection box for the messaging integration to be unlinked.
4. Select Actions on selected rows..., then click Unlink account.
Your ServiceNow account is unlinked from the Now Actions messaging integration (the link is inactive).

**Note:** Even though you unlinked your account, you still receive notifications in any group channels to which you belong.

5. Disable the messaging channel in your Notification Preferences.
   a) Select the gear icon in the banner frame to access the System Settings window.
   b) Under Notification Channels, disable the appropriate messaging channel.

**Note:** If you want to link your ServiceNow account again, follow the steps in *Link your ServiceNow user account to your Slack or MS Teams account for Now Actions* on page 868.

**Email digests**

An email digest is a single email that summarizes the activity for a selected notification and its target record during a specified time interval. You can enable an email digest to reduce the number of notifications received when frequent updates to the associated record occur within a short time period.
How email digests work

In new and upgraded instances, the Email digest (com.glide.email_digest) plugin is activated by default. Your instance must use the UI16 interface, since the email digest feature involves setting user notification preferences in the System Settings window.

Admins determine which notifications can be delivered in an email digest and configure the digest content for those notifications. Admins can also control the intervals for digests. An interval is the length of time that notifications are collected for the digest, such as daily or hourly.

Note: Email digests apply to email notifications only and are not supported for SMS messages, push notifications, and activity streams.
Users enable the digest and select the digest interval for a specific notification in their notification preferences. The system accumulates the notifications that normally would be sent during the specified interval and summarizes them in the email digest.

When processing an email digest, the system:

- Stores the digest configuration for the notification in the Notifications [sysevent_email_action] table.
- Temporarily stores the notification content accumulated for a user in the Email Digest Parts [sys_email_digest_part] table and the Email Digest Part Users [sys_email_digest_part_user] table.
- Runs an email digest job every 15 minutes to check when a digest is ready to be sent to a user.

The system uses the digest interval to determine when the digest is ready to be sent. The digest interval begins when the first notification is triggered for the user and stops at the end of the interval time.

- Sends the email digest to the user soon after the selected digest interval ends.

For example, if a user selects an hourly digest interval and the first notification is triggered at 08:15, the interval starts at 08:15. When the digest interval ends, the system generates the email digest approximately one hour later, at about 09:15 or shortly after, depending on when the email digest job ran.

Set up email digests

What to do — admins

1. Review the base system digest intervals and if needed, create or modify intervals.

   The base system digest intervals are one day (24 hours), one hour, every four hours, and seven days (weekly).

2. Determine the email notifications that can be delivered in a digest and configure the email digest content for those notifications.

   When determining which notifications are appropriate for an email digest, consider the notification content and intervals that your users can select. For example, digests that can be generated weekly might be better suited for notifications that are non-urgent.

What to do — all users

For a notification that can be delivered in an email digest, enable the email digest in your notification preferences (Notifications tab in the System Settings window). You also specify the interval time that the notifications are accumulated.

Next step

If you are an admin, begin the digest setup process by reviewing the base system email digest intervals and create or modify the intervals.

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Create or modify email digest intervals

Admins can create or modify the email digest intervals (length of time) during which activity for a selected notification is accumulated in an email digest. Users select a digest interval when they enable an email digest in their notification preferences.

Role required: admin

Before adding an email digest interval, review the base system digest intervals in the Digest Intervals [sys_email_digest_interval] table. You can modify intervals, including the base system intervals, which are one day (24 hours), one hour, every four hours, and seven days (weekly).

1. Navigate to System Notification Email Digest Intervals.

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>To add an interval</td>
<td>Click New.</td>
</tr>
<tr>
<td>To modify an interval</td>
<td>Select the interval to be changed.</td>
</tr>
</tbody>
</table>

2. Enter the new or changed interval information:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Interval name that describes the interval length of time, for example: Every 2 hours.</td>
</tr>
<tr>
<td>Interval</td>
<td>Length of the interval, either number of Days or Hours (hours, minutes, and seconds). The minimum time length allowed is one hour, and the maximum time length allowed is seven days (one week).</td>
</tr>
</tbody>
</table>

3. If you created an interval, click Submit. Or, if you changed an interval, click Update.

The system updates the Digest Intervals [sys_email_digest_interval] table with the new or modified interval. The digest interval is listed as an option in the notification preferences (Notifications tab in the System Settings window) when a user enables a digest for the notification. For example:
4. To delete an interval, select the interval to be deleted in the Digest Intervals [sys_email_digest_interval] table and click Delete.

    **Note:** If the interval is in use, the system does not remove the interval.

Determine the email notifications that can be delivered in a digest and **configure the email digest content** for those notifications.

**Configure email digests**

Use the Notification form to create or modify the content of an email digest for a notification. You can also disable the email digest for a notification so that it is not available in the notification preferences of your users.

**Role required:** admin

When you **create or update a notification**, use the What Digest will contain tab of the Notification form to configure the email digest for the notification. After you define the digest content, the digest option for the notification is available in the notification settings of your users.

1. Navigate to System Notification Email Notifications.

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you are creating a notification</td>
<td>Click New to open the Notification form.</td>
</tr>
<tr>
<td>If you are modifying a notification</td>
<td>Select the notification to be changed.</td>
</tr>
</tbody>
</table>

2. In the Notification form, select the Allow Digest check box to display the What Digest will contain tab and define the digest content.
3. Complete the fields in the What Digest will contain tab. The example shows the default view of the tab. The advanced view contains additional fields (see table).
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digest Template</td>
<td>If you want to reuse existing content, such as headers or footers, select an email template to add content to the email digest.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Digest Subject</td>
<td>Enter the subject line for the email digest. The subject can include variables from the Select variables column. If empty, the system uses the Subject value from the Email template. If you enter a value in this field, it overrides the template value.</td>
</tr>
<tr>
<td>Digest HTML</td>
<td>Enter the recurring content for the email digest. The digest content can include variables from the Select variables column. Variables map to column names available from the notification table, its parent tables, and reference tables. Use variables to include values from a record in the table such as an incident short description or comments and work notes. To prevent adding extra <code>&lt;p&gt;</code> and <code>&lt;div&gt;</code> elements to your email digest, see the blog post <a href="https://community.servicenow.com">Extra line spacing with paragraph tags in email client</a> by a ServiceNow employee in the ServiceNow Community.</td>
</tr>
<tr>
<td>Digest Separator (HTML)</td>
<td>Use the line to separate each item summarized in the digest.</td>
</tr>
<tr>
<td>Digest From</td>
<td>Enter the email address to be used in the From field of the email digest. For example, <a href="mailto:helpdesk@yourcompany.com">helpdesk@yourcompany.com</a>. The email address must be in a valid format, otherwise a notification message appears near the field. Changing this address requires an advanced email setup such as enabling email forwarding.</td>
</tr>
<tr>
<td>Digest Reply To</td>
<td>Enter the email address that you want people to use when replying to the email digest. For example, <a href="mailto:helpdesk@yourcompany.com">helpdesk@yourcompany.com</a>. The email must be in a valid format, otherwise a notification message appears near the field. Changing this address requires an advanced email setup such as enabling email forwarding.</td>
</tr>
<tr>
<td>Digest Text</td>
<td>Enter the recurring content of the email digest to send in plain text. This field appears when you set the content type to HTML and plain text or Plain text only.</td>
</tr>
</tbody>
</table>
Enable an email digest

In your notification preferences, you can enable an email digest that summarizes the activity for a selected notification during a specified time interval. The digest is a single email that you receive instead of the individual notifications generated during the specified interval.

Role required: user

The email digest option is available for a notification (in your notification preferences) only when your admin has configured the email digest content for that notification.

Consider enabling an email digest to reduce the number of emails you would normally receive when the target record for a notification is frequently updated within a short time period.

1. Click the gear icon in the banner frame to open the System Settings window, and click the Notifications tab.

2. Select the notification:
   a) In the Notifications By Category section, click the row or right arrow (>) of the category that you want to view.
   b) In the list of notifications for the category, click the row or right arrow (>) next to the notification that you want to edit.

3. To enable or disable an email digest for the notification, if an email digest is available:
   a) Click the Email Digest switch.
b) If you enabled the digest, select the Interval (length of time) during which the notifications are accumulated.

The digest interval begins with the first occurrence of notification activity. For example, if you select the daily (1 Day) interval and the first notification occurs at 07:00, the system begins accumulating notifications at 07:00 and stops at 07:00 the next day.

Soon after the interval ends, the system sends the email digest to you instead of sending the individual notifications generated during the digest interval. If you disabled the digest, the system immediately stops accumulating the notifications for the digest and does not send the email digest. The system resumes sending the notifications as they are generated.

Notify

Notify allows you to integrate with the Twilio telephony service to send and receive phone calls and SMS messages from within your instance.

Notify automatically creates a TwiML application in the Twilio service and configures the application to use the instance as an endpoint. Phone numbers associated with the Twilio subaccount are imported to Notify.

To manage phone numbers per instance, set up one Twilio subaccount for each instance and configure all relevant phone numbers for the instance under that subaccount. The Notify plugin must be active to access the Notify product.

Note: Only one Twilio account (or subaccount) can be configured on Notify at a time.
Activate Notify

The Notify plugin (com.snc.notify) requires a separate subscription. This plugin includes demo data and activates related plugins if they are not already active.

Role required: admin

Notify activates these related plugins if they are not already active.

<table>
<thead>
<tr>
<th>Plugin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E164 Compliant Phone Number [com.glide.phone_number]</td>
<td>Provides E-164 compliant phone number support.</td>
</tr>
</tbody>
</table>

To purchase a subscription, contact your ServiceNow account manager. After purchasing the subscription, activate the plugin within the production instance.

1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.
   - If the plugin depends on other plugins, these plugins are listed along with their activation status.
   - If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).
4. If available, select the Load demo data check box.
   - Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.
   - You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.
5. Click Activate.

Migrating from Legacy Notify

When migrating to Notify from the Legacy Notify functionality, several changes are made to the instance.

If the Legacy Notify functionality is already enabled, several automatic changes occur when you activate Notify:

- The Legacy Notify menu is removed from the application navigator.
- Two separators are added to the new Notify menu: Legacy Notify and Legacy Notify Admin. New modules that replace the Legacy Notify modules are added to these sections.

**Note:** The added modules are not the same modules that were in the Legacy Notify menu. Any customizations made to the Legacy Notify modules are not preserved.

- The notify_admin role allows access to Notify modules.

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• The notifynow_admin role allows access to Legacy Notify modules.
• All workflow activities from the Legacy Notify application are moved to the Legacy Notify group.

Differences between Notify and Legacy Notify

Describes the differences between the Notify and Legacy Notify applications, including architecture, workflows, Twilio support, and task-initiated conference calls.

<table>
<thead>
<tr>
<th>Legacy Notify (com.snc.notifynow)</th>
<th>Notify (com.snc.notify)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manage a single number from a Twilio account per instance.</td>
<td>Provides support for multiple numbers per Twilio account, especially gross-geographical scenarios.</td>
</tr>
<tr>
<td>Does not include support for customizable workflows for Voice and SMS incoming or outgoing scenarios.</td>
<td>Workflow-driven approach for handling incoming and outgoing Voice and SMS events, making the integration easy to customize.</td>
</tr>
<tr>
<td>Hard-coded join conference SMS and IVR prompts for joining a conference call.</td>
<td>Includes a configurable workflow for handling SMS and Voice IVR prompts.</td>
</tr>
<tr>
<td>Support for SMS-based answers and threaded conversations.</td>
<td>Notify On Task support for sending SMS and initiating conference calls from any task.</td>
</tr>
</tbody>
</table>

Configure Notify with the Twilio service

You can configure Notify to use the Twilio telephony service.

You must have an SID and authentication token for an active Twilio account (https://www.twilio.com/).

**Important:** Ensure that each instance on which you configure Notify uses a different Twilio account. Each account specifies a unique SID, authentication token, telephone numbers, and endpoint. Using the same account across multiple instances may cause your Twilio service configuration to be overwritten.

**Note:** Account and subaccount are Twilio categorizations and both act the same for a ServiceNow instance.

Role required: notify_admin

1. Navigate to Notify Twilio Configuration.
2. On the Twilio Account Properties page, enter your Account SID.
   **Note:** This value is only visible to users with the admin role.
3. Enter your Auth Token.
   **Note:** This value is only visible to users with the admin role.
4. Click Connect.
   If the account is not associated with an instance and the connection is successful, a read-only list of E.164 and short code phone numbers associated with this Twilio account appears. This list displays the phone number, supported capabilities such as voice or SMS, the country for each Twilio number, and the Notify number group to which the number belongs.

   If the account is already associated with an instance, the system displays an error message. To connect to this account, you must do one of the following:
- Disconnect the account from the instance
- Clear the request URLs on Twilio’s TwiML app

**Note:** If you buy or release numbers on the Twilio account, open the configuration page again to refresh the list of numbers. Numbers removed from the Twilio service remain as Notify Number records, but with the Active field set to false. Use only active phone numbers for inbound or outbound communication.

Phone numbers and short codes are provided by Twilio once the account is successfully connected and are stored on the Notify Phone Numbers [notify_number] table. Assign each number to a number group. Number groups allow you to control which workflows run when using the phone numbers in each number group.

Create a number group

Number groups allow you to group Notify phone numbers and share workflows across grouped numbers.

Role required: notify_admin

Each phone number within Notify has an associated number group. Numbers within a group use the same workflows for handling incoming and outgoing calls and SMS messages.

Numbers associated with a group appear on the Notify Phone Numbers related list on the Notify Phone Number Group form.

1. Navigate to Notify Number Groups.

![Number Groups](image)

2. Click New.

3. Enter a Name, and select Notify: (Re)join Conference Call for the Incoming call workflow field.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Unique name for the number group.</td>
</tr>
<tr>
<td>Incoming call workflow</td>
<td>Workflow to run when there is an incoming phone call for this group.</td>
</tr>
<tr>
<td>Incoming SMS workflow</td>
<td>Workflow to run when there is an incoming SMS message for this group.</td>
</tr>
<tr>
<td>Outgoing call workflow</td>
<td>Workflow to run when there is an outgoing phone call for this group.</td>
</tr>
<tr>
<td>Outgoing SMS workflow</td>
<td>Workflow to run when there is an outgoing SMS message for this group.</td>
</tr>
</tbody>
</table>


Short codes can only be associated with SMS workflow groups. You cannot add an incoming or outgoing call to a short code group.

4. Click Submit.

**Associate a number to a number group** on page 885

After creating a number group, associate numbers with that group to use the selected workflows.

**Note:** Each phone number can only be associated with one number group.
Associate a number to a number group

Associate a Notify number to a number group to use inbound and outbound workflows.

Role required: notify_admin

1. Navigate to Notify Numbers.

2. Click the listed phone number and assign it to a Number Group, as appropriate.

   **Note:** Each phone number can only be associated with one number group.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Number for the entry.</td>
</tr>
<tr>
<td>Phone number</td>
<td>E.164 phone number, if applicable.</td>
</tr>
<tr>
<td>Notify group</td>
<td>(Optional) Group to which this number is assigned.</td>
</tr>
<tr>
<td>Number owner</td>
<td>Service provider of the number.</td>
</tr>
<tr>
<td>Short Code</td>
<td>Short code number, if applicable.</td>
</tr>
<tr>
<td>Active</td>
<td>Check box that indicates whether the number is active or not.</td>
</tr>
</tbody>
</table>

3. Click Update.

Disconnect from a Twilio account

If a Twilio account is already associated with a different system, disconnect the account from the other system before connecting to the current instance.

Role required: notify_admin

1. Navigate to Notify Twilio Configuration.
2. On the Twilio Account Properties page, click Disconnect.
3. In the Disconnecting Twilio account pop-up window, click OK.

   The account is disconnected from the instance. The system clears the Account SID and Auth Token fields and deactivates the list of associated phone numbers.
Outbound communication requirements

Outbound communications initiated through Notify, such as phone calls and SMS messages, must satisfy certain requirements.

These requirements apply to all outbound communication initiated through Notify, such as by using Notify workflow activities or the Notify JavaScript API.

Invalid numbers prevent Notify workflows from running and cause an error to be logged. Set the glide.notify.debug property to true to create detailed error logs.

Recipient number requirements

These requirements apply to any number that receives a Notify phone call or message.

- The calling country must be authorized from Twilio.
- The number must be E.164 compliant.
- The number must be different than the phone number used to initiate the call or message.

How Notify processes incoming calls

Notify processes incoming calls using workflow activities.

Any Notify activity that manages incoming phone calls creates a record on the Notify Workflow Activity [notify_wf_activity] table. Each notify_wf_activity record is associated with a single call. These records store JSON data detailing the actions to send to the telephony provider.

Notify processes incoming calls in the following way:

1. A person calls a Notify phone number.
2. Notify launches the incoming call workflow associated with that Notify phone number.
3. The workflow reaches a Notify activity and invokes the activity onExecute() function.
4. The activity creates a new notify_wf_activity record detailing any actions to take, with a State value of execute.
5. Notify sends the specified actions to the telephony provider.
6. The notify wf activity record State changes to processed.
7. The telephony provider sends a response.
8. Response arguments, such as user input or recording info, are stored as JSON data in the notify_wf_activity response_args field.
9. The notify_wf_activity State changes to complete.
10. The JSON data from the notify wf_activity record is copied to the Last action field in the Notify call record that triggered the workflow.
11. The workflow invokes the onUpdate() function in executing activities.
12. The activity confirms that the associated notify wf_activity record has completed, and changes the activity state to finished.
13. The workflow transitions to the next activity.
View a list of Notify calls

As a Notify administrator, you can view a list of calls made to or from Notify.

To view a list of calls, navigate to Notify Calls.

Call records are generated automatically when a user calls a Notify number or when a user makes an outbound call through Notify. You cannot create call records manually. You can delete call records.

**Note:** Deleting a call record may result in cascade deletion of related records.

For Notify calls where the source is specified, such as a task number, the source is added to the Notify Calls [notify_call] table in the Source column. For Notify conference calls where the source is specified, the source is added to the records for each of the calls in the conference.

<table>
<thead>
<tr>
<th>Call status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>No answer</td>
<td>The call is not answered, or if the number is configured for voicemail, a message is left on the voice mailbox.</td>
</tr>
<tr>
<td>In-progress</td>
<td>The call is answered and is active.</td>
</tr>
<tr>
<td>Completed</td>
<td>The conference call is completed.</td>
</tr>
<tr>
<td>Failed</td>
<td>The provided phone number is invalid.</td>
</tr>
</tbody>
</table>

Notify conference calls

Notify allows you to connect multiple callers to a single conference call.

Conference call records are stored on the Notify Conference Calls [notify_conference_call] table. Conference call participant records are stored on the Notify Conference Call Participants [notify_participant] table.

Conference call and participant records are created automatically when starting and connecting to a conference call. Most fields, such as the Duration of a call are set automatically using business rules.

**Note:** If a participant attempts to join a conference call using an invalid phone number, the caller is added to the participant list and the phone number is marked with a status of Invalid.

Notify administrators, major incident manager, or communications manager can manage conference call participants, such as by muting or kicking them.

Several conference call workflows are available by default. These workflows can be used for incoming and outgoing calls and incoming SMS messages. Conference call workflows are:

- Notify: (Re)join Conference Call
- Notify: Join Conference Call Via SMS

The number groups Conference Call Group and Notify On Task Group use these conference call workflows by default.

Mute or kick a conference call participant

You can mute or kick conference call participants.

Role required: notify_admin, major_incident_manager, communication_manager
Before starting this procedure, ensure there is an active conference call with one or more participants.

1. Navigate to Notify Conference Calls.
2. Select a conference call.
3. In the Notify Conference Call Participants related list, select a participant.
4. Click Mute or Kick.

You can unmute a muted participant but cannot add a kicked participant back to the conference call. A kicked participant may rejoin the conference call, such as by calling in again.

**Use SMS with Notify**

You can send and receive SMS messages using Notify.

The Notify application stores inbound and outbound SMS messages in the Notify Messages [notify_message] table.

Notify supports sending concatenated SMS messages. Messages that exceed 160 characters, or 70 unicode characters, are split into multiple messages. This may affect your total telephony cost as each message can incur a cost. Some mobile carriers, such as Sprint, do not support concatenated SMS messages.

To send SMS messages to an individual recipient, use the Notify API sendSMS method. This method takes one recipient as an input parameter. You can also use the send SMS workflow activity.

To send SMS messages to one or more recipients, use the Notify API sendBulkSMS method. This method takes a list as an input parameter and uses one API call to send multiple messages. Include the list of phone numbers in an array in the API call. This method improves performance by streamlining platform checks and Notify number validation.

**Notify workflow activities**

Notify workflow activities manage calls and SMS messages in Notify.

All Notify workflows that manage a phone call must run on the notify_call table. Call-related Notify activities can be added only to workflows where the Table field value is Notify Call [notify_call].

You can identify if an outbound call was answered by a human or by an answering machine from within a Notify workflow by evaluating the current.is_human variable, such as with an If workflow activity. This variable is set by the telephony provider when an outbound call is answered. This variable is always true for inbound calls.

---

**Note:** Do not add a Timer activity between multiple Notify activities that interact with active phone calls.

---

**Important:** When creating a Notify workflow, set the workflow If condition matches field to -- None --. Notify controls which workflow to run based on the configured number groups.

**Join conference call workflow activity**

The Join Conference Call activity connects an incoming or outgoing call to a Notify conference call.

Notify includes the workflows Notify: (Re)join Conference Call and Notify: Join Conference Call Via SMS to demonstrate how to use the join conference call activity to connect inbound and outbound calls, and inbound SMS messages to a conference call.
**Input variables**

Input variables determine the initial behavior of the activity.

### Table 174: Input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced</td>
<td>Select this check box to display advanced configuration options.</td>
</tr>
<tr>
<td>Script</td>
<td>Specify advanced configuration options using JavaScript, such as if the new participant should be muted upon joining the conference call. You can access values from the workflow scratchpad.</td>
</tr>
</tbody>
</table>

**Conditions**

The conditions determine which transition comes after this activity. The join conference call activity does not specify any conditions by default.

You can add an error condition to this activity. The activity transitions through the error condition if the conference_call scratchpad variable is not set.

**Scratchpad entries**

The activity uses the workflow scratchpad to read persistent values.

### Table 175: Values read from scratchpad

<table>
<thead>
<tr>
<th>Scratchpad variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>workflow.scratchpad.conference_call</td>
<td>A GlideRecord for a single conference call record. A call processed by this activity is added to this conference call. If this value is not specified, the join conference call activity will log an error. When initiating an outgoing call workflow using the Notify API call(String notifyPhoneNumber, String toPhoneNumber, GlideRecord conferenceCall) method, this scratchpad value is set automatically to the conference call GlideRecord. For incoming call workflows, or workflows initiated using a different mechanism, you must explicitly set this scratchpad value.</td>
</tr>
</tbody>
</table>

**Enable the hangupOnStar attribute**

System administrators can enable the hangupOnStar attribute and use it in the Join Conference Call workflow activity. When hangupOnStar is enabled (set to true), participants in a conference call can press...
the * button to disconnect from the call. Control is returned to the workflow, which can be used to trigger customer-defined actions.

To enable the hangupOnStar attribute:

1. Navigate to Workflow Administration Workflow Versions.
2. Open the Notify: (Re)join Conference Call workflow.
3. Click the Show Workflow related link.
4. To modify the workflow, click the WorkFlow Actions icon and click Checkout.
5. Open the Join Conference Call workflow activity.
6. Enable the Advanced check box to display the Script field.
7. Set the hangupOnStar attribute to true. The default setting is false.
8. Click Update.
9. Click the WorkFlow Actions icon and click Publish to save the changes.

Call workflow activity

The Call activity makes outbound phone calls using a Notify workflow.

Input variables

Input variables determine the initial behavior of the activity.

Table 176: Input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notify Number</td>
<td>The Notify phone number to make the call from. When you initiate a call, the outgoing call workflow for the number group associated with this number runs.</td>
</tr>
<tr>
<td>Phone number to call</td>
<td>The E.164-compliant phone number to call.</td>
</tr>
<tr>
<td>Advanced</td>
<td>Select this check box to use a script to determine number to call, and the Notify number to call from instead of using the Phone number to call and Notify Number variables.</td>
</tr>
<tr>
<td>Script</td>
<td>Define a script that controls which number to call. This script should return a string listing the Notify number sys_id, as well as the phone number to call, such as {notify_number: 'sys_id', phone_number: '+316...'}</td>
</tr>
</tbody>
</table>
You can add an error condition to this activity. The activity transitions through the error condition if the call could not be set up due to invalid data returned by the advanced script.

Send SMS workflow activity

The send SMS workflow activity to send short text messages using Notify to users’ phones.

Input variables

Input variables determine the initial behavior of the activity.

Table 177: Input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>From</td>
<td>Select the Notify phone number to use to send the SMS message.</td>
</tr>
<tr>
<td>Advanced</td>
<td>Select this check box to use JavaScript to determine which numbers to send the message to, and the Notify number to use to send the message.</td>
</tr>
<tr>
<td>To</td>
<td>Select any number of users to send the message to. The user record must have a E.164-compliant phone number or notification device configured for SMS messages.</td>
</tr>
<tr>
<td>To (groups)</td>
<td>Select any number of groups to send the message to. All members of that group with an E.164-compliant phone number or SMS notification device receive the message.</td>
</tr>
<tr>
<td>Message</td>
<td>Enter the message to send. You can add field values from the current record by using the Select variables box. You can also add values from the workflow scratchpad. If a field and a scratchpad variable have the same name, the field value is used. Because you can use variables in this message, it is not possible to determine the length of the message at design time. If the activity sends a message that is longer than supported by the telephony provider, the message is truncated and the instance logs a warning.</td>
</tr>
</tbody>
</table>
## Variable

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>To (script)</td>
<td>Enter a script to determine which numbers to send the message to, and the Notify number to use to send the message. The script should return a JavaScript object with the format `{notify_number: &quot;...sys_id...&quot;, users: [...], groups: [...], numbers: [...]}. Specify the users or groups to send the message to as an array of sys_id values. Specify other numbers as an array of E.164-compliant phone numbers. This field appears only if Advanced is selected.</td>
</tr>
</tbody>
</table>

### Conditions

The conditions determine which transition comes after this activity. This activity does not specify any conditions by default.

You can add an error condition to this activity. The activity transitions through the error condition if the Notify number used to make the call is not configured correctly or unable to send SMS messages, or if an error occurs while sending the SMS.

### Forward call workflow activity

The Forward Call activity forwards a Notify call to an E.164-compliant phone number.

If the person receiving a forwarded call hangs up, the forward call activity completes and transitions to the next activity. Any further Notify activities in the workflow run for the caller only.

### Input variables

Input variables determine the initial behavior of the activity.

### Table 178: Input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phone number to call</td>
<td>Enter the phone number to forward the call to.</td>
</tr>
<tr>
<td>Timeout (in seconds)</td>
<td>Enter the amount of time to wait for the call to be answered before hanging up.</td>
</tr>
<tr>
<td>Record</td>
<td>Select this check box to record the conversation.</td>
</tr>
</tbody>
</table>

### Conditions

The conditions determine which transition comes after this activity. The forward call activity does not specify any conditions by default.

You can add an error condition to this activity. The activity transitions through the error condition if the phone number to call is invalid.
Input workflow activity

The Input activity creates a phone menu by presenting a list of options on a Notify call.

Input Variables

Input variables determine the initial behavior of the activity.

Table 179: Input Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of digits</td>
<td>Specify the maximum number of digits the caller can enter. A caller can enter fewer digits than the maximum and press the Finish key to complete the entry.</td>
</tr>
<tr>
<td>Finish key</td>
<td>Specify the key a caller can press on their phone when finished selecting a menu option.</td>
</tr>
<tr>
<td>Timeout (in seconds)</td>
<td>Specify the amount of time to wait before closing the menu automatically when the caller does not select a menu option.</td>
</tr>
<tr>
<td>Advanced</td>
<td>Select this check box to use a script to build the phone menu, instead of using the activity conditions.</td>
</tr>
<tr>
<td>Script</td>
<td>Define the script to build the phone menu. The script must specify an answer variable as a JavaScript object with the following format:</td>
</tr>
</tbody>
</table>
|                      | ```javascript
|                      |     answer = {
|                      |         1: {
|                      |             "say": "https://some_url.com/options/one.mp3",
|                      |             "myCustomData": "some data here"
|                      |         },
|                      |         2: {
|                      |             "say": "type 2 to speak to a representative",
|                      |             "language": "en-US",
|                      |             "myCustomData": "some more data here"
|                      |         }
|                      | ```                                                                                                                                 |
|                      | The script may specify either a text-to-speech string and language code or the URL of a prerecorded message for each entry. You can also add optional attributes to store related information, such as myCustomData in the example above. |
Conditions

The conditions determine the transition that comes after this activity.

The input activity does not specify any conditions by default. You must define conditions to build the phone menu. Each condition is one option on the phone menu. Notify reads the text from each condition Name to the caller, up to 100 characters per condition.

You can specify a language for each condition by prefixing the message with the language code, in the format xx-XX:<Message>. For example, add fr-CA: for Candian French. Available languages are stored on the Notify Language [notify_language] table.

The condition that the activity transitions through depends on the digits entered by the caller. Set the condition Condition value to parseInt(workflow.scratchpad.digits) == <expected digits>. For example, to transition through a condition when the caller presses the number 3, set the Condition to parseInt(workflow.scratchpad.digits) == 3.

You can add an error condition to this activity. The activity transitions through the error condition if the advanced script returns an invalid value, or if the text to say for a condition is empty.

Scratchpad Entries

The activity uses the workflow scratchpad to write persistent values.

Table 180: Values written to scratchpad

<table>
<thead>
<tr>
<th>Entry</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>workflow.scratchpad.digits</td>
<td>The digits entered by the caller, as a string.</td>
</tr>
<tr>
<td>workflow.scratchpad.menu&lt;activity name&gt;</td>
<td>The entire answer variable, if using the advanced script option. You can access this menu from other activities after this activity successfully executes. For example, if the activity name is choices, you can access values from the menu using var previousActivity = &quot;choices&quot;; var choicesMenu = workflow.scratchpad.menu[previousActivity]; var menuItem = choicesMenu[workflow.scratchpad.digits]; // Selects the menu item based on the caller's input. var selectedValue = menuItem.myCustomData; // get the custom data for the selected menu item.</td>
</tr>
</tbody>
</table>

Hangup workflow activity

The Hangup activity disconnects an active Notify phone call.

You can use the hangup activity to disconnect only calls that have been answered. Use the reject activity to disconnect calls that have not been answered.
Play workflow activity

The Play activity plays a sound file on a Notify call.

**Input Variables**

Input variables determine the initial behavior of the activity.

**Table 181: Input Variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td>Enter the URL of a sound file to play. If the URL is inaccessible, or if the audio file mime type is not supported by the telephony provider, the play activity is skipped.</td>
</tr>
<tr>
<td>Loop</td>
<td>Enter the number of times the sound file should play.</td>
</tr>
</tbody>
</table>

**Conditions**

The conditions determine which transition comes after this activity. The play activity does not specify any conditions by default.

You can create an error condition to handle errors with the sound file. The activity transitions through the error condition if the specified sound file is not available, or has an unsupported mime type. Supported mime types are listed on the Notify Audio MIME Types [notify_mime_type] table.

Record workflow activity

The Record workflow activity records audio from a user on a Notify call.

**Input Variables**

Input variables determine the initial behavior of the activity.

**Table 182: Input Variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max duration (in seconds)</td>
<td>Enter the maximum duration, in seconds, allowed for a recording.</td>
</tr>
<tr>
<td>Timeout (in seconds)</td>
<td>Enter the amount of time to wait before ending a recording automatically when the caller is silent.</td>
</tr>
<tr>
<td>Finish Key</td>
<td>Specify the key a caller can press on their phone to end the recording.</td>
</tr>
</tbody>
</table>
Scratchpad Entries

The activity uses the workflow scratchpad to store persistent values.

The record activity adds the recording variable to the workflow scratchpad. This variable stores metadata about the recording, such as URL, ID, and duration. You can access the following values from this variable.

Table 183: Values written to scratchpad

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>recording.recordingDuration</td>
<td>The duration of the recording, in seconds.</td>
</tr>
<tr>
<td>recording.from_number</td>
<td>The caller's phone number, including country code.</td>
</tr>
<tr>
<td>recording.notify_number</td>
<td>The Notify phone number used to respond to the call, including country code.</td>
</tr>
<tr>
<td>recording.recordingID</td>
<td>The ID used by the telephony provider to identify the recording.</td>
</tr>
<tr>
<td>recording.recordingURL</td>
<td>The URL from the telephony provider to access the recording.</td>
</tr>
</tbody>
</table>

Reject workflow

The Reject workflow activity rejects an incoming Notify call.

You can use the reject activity to disconnect only calls that have not yet been answered. Use the hang up activity to disconnect calls that have been answered.

Input variables

Input variables determine the initial behavior of the activity.

Table 184: Input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>reason</td>
<td>Select a reason for rejecting the call, such as busy.</td>
</tr>
</tbody>
</table>

Say workflow activity

The say workflow activity allows you to play a message, using text to speech, on a Notify call.

Input variables

Input variables determine the initial behavior of the activity.
Table 185: Input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text to say</td>
<td>Specify the text to read.</td>
</tr>
<tr>
<td>Language</td>
<td>Select the language and locale to use when reading text.</td>
</tr>
<tr>
<td>Advanced</td>
<td>Select this check box to use a script to define the language and message,</td>
</tr>
<tr>
<td></td>
<td>instead of using the Text to say and Language values.</td>
</tr>
<tr>
<td>Script</td>
<td>Define a script to set what text is read on the call. The script must</td>
</tr>
<tr>
<td></td>
<td>return a string that defines the language and the text to read. For</td>
</tr>
<tr>
<td></td>
<td>example, to play an English-language message, return</td>
</tr>
<tr>
<td></td>
<td>{language: 'en-US', text: 'Text to read'}.</td>
</tr>
</tbody>
</table>

Forward to notify client workflow activity

The forward to notify client workflow activity connects a phone call to a Notify WebRTC client.

Input variables

Input variables determine the initial behavior of the activity.

Table 186: Input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User</td>
<td>Select the user to connect the call to.</td>
</tr>
<tr>
<td>Advanced</td>
<td>Select this check box to use a script to determine which client to connect</td>
</tr>
<tr>
<td></td>
<td>to, instead of using the User variable.</td>
</tr>
<tr>
<td>Script</td>
<td>Define a script that controls which client to connect to. This script</td>
</tr>
<tr>
<td></td>
<td>should return a GlideRecord for a single User [sys_user] record.</td>
</tr>
<tr>
<td>Timeout (in seconds)</td>
<td>Enter the amount of time to wait for the call to be connected before</td>
</tr>
<tr>
<td>Record</td>
<td>Select this check box to record the call.</td>
</tr>
</tbody>
</table>

Conditions

The conditions determine which transition comes after this activity. The Forward to Notify Client activity does not specify any conditions by default.

You can add an error condition to this activity. The activity transitions through the error condition if there is an issue with the Notify client.
Queue workflow activity

The Queue activity places an active Notify call in a queue.

Add the Queue activity to a workflow on the Notify Call [notify_call] table to put the current call on hold. This activity does not specify any input variables.

The queue that the call is added to is given a random ID.

Notify activity event handlers

Notify workflow activities provide JavaScript functions that are invoked automatically when your telephony provider broadcasts certain events.

When the Twilio service broadcasts an event related to a Notify call, such as the caller hanging up, the event is processed by the workflow associated with that Notify call. All currently-executing Notify activities in that workflow invoke a JavaScript function associated with that event.

Not all activities that support an event provide a default event handler implementation. You can provide an implementation for those event handlers when creating custom Notify activities.

Creating Notify activities

Default Notify workflow generally perform a single action, such as initiating a phone call. You can create custom Notify workflow activities to implement more complex functionality.

Use event handler functions in each Notify activity definition to design your own activity behavior. For example, you can set the activity result if the caller hangs up by using the onCompleted function.

```javascript
onCompleted: function() {
  activity.result = 'call_ended';
},
```

When creating a new Notify workflow activity, follow these design principles.

- Within onExecute event handler function, create a new NotifyAction object. Use this object to create a simple or complex action, then serialize the object to the notify_wf_activity table.
- Within the onUpdate event handler function, deserialize the NotifyAction object from the notify_wf_activity table and use this object to perform any other operations.
- Use the other event handler functions and the Notify as needed to implement the desired activity behavior.

Available Notify activity event handlers

When creating Notify workflow activities, you can use event-handler functions to respond to events from a telephony provider.

Not all activities or telephony providers support all events. For example, the Reject activity ends the call before the caller connects so the onNoAnswer function is never invoked from this activity.

**Note:** When configuring an activity to respond to an event, ensure that your telephony provider supports that event.

The following table describes available event handlers and lists the Notify workflow activities that can invoke each handler.
Table 187: Event handlers

<table>
<thead>
<tr>
<th>Handler</th>
<th>Description</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>onExecute</td>
<td>Runs when the activity first runs.</td>
<td>All call-related activities</td>
</tr>
<tr>
<td>onUpdate</td>
<td>Runs when the call record associated with the workflow is updated.</td>
<td>All call-related activities</td>
</tr>
<tr>
<td>onCompleted</td>
<td>Runs when a call ends.</td>
<td>All call-related activities</td>
</tr>
<tr>
<td>onRinging</td>
<td>Runs when a call starts ringing.</td>
<td>Forward call, call, join conference call, forward to notify client</td>
</tr>
<tr>
<td>onInProgress</td>
<td>Runs when both parties are connected on a call.</td>
<td>Forward call, call, join conference call, forward to notify client</td>
</tr>
<tr>
<td>onNoAnswer</td>
<td>Runs when a call is not answered.</td>
<td>Forward call, call, join conference call, forward to notify client</td>
</tr>
<tr>
<td>onBusy</td>
<td>Runs when a called number is busy.</td>
<td>Forward call, call, join conference call, forward to notify client</td>
</tr>
<tr>
<td>onFailed</td>
<td>Runs when an error occurs.</td>
<td>All call-related activities</td>
</tr>
</tbody>
</table>

Notify languages

Notify supports multiple languages when using text-to-speech.

For example, when using the input or say workflow activities, you can specify which language to use when reading the text.

The list of available languages is stored on the Notify Languages [notify_language] table. By default, languages supported by all Notify telephony providers are available. You can add additional languages if they are supported by your specific telephony provider.

Using Notify with tasks

Notify allows you to send initiate conference calls and send SMS alerts from task records.

This functionality is available for all tables that extend the Task table, such as Incident, Problem, or Change. All calls and messages made from tasks are initiated using a single Notify phone number (E.164 or short code). You can configure which phone number is used by setting the property glide.notify.task.phone_number.

Send an SMS alert from a task

You can use Notify to send SMS alerts from a task record.

Role required: itil
Notify must be set up before you can use Notify on task. Ensure there are Notify phone numbers (E.164 or short code) in number groups with SMS workflows. Also ensure the property glide.notify.task.phone_number is set to one of these Notify phone numbers.

1. Navigate to any task record, such as an incident or change.
2. Click the Send SMS related link.
3. Select one or more Recipients to receive the SMS.
4. Enter the Message to send.
   The task record number is added to the message automatically.
5. Click Send.
   Any SMS records created from a task are associated with that task. You can view associated SMS messages from the task record in the SMS Messages related list. You may need to configure the form to add the related list.

Start a conference call from a task

You can use Notify to start conference calls from a task record.

Role required: itil

Notify must be set up before you can use Notify on task. Ensure there are Notify phone numbers (E.164 or short code) in number groups with phone call workflows. Also ensure the property glide.notify.task.phone_number is set to one of these Notify phone numbers.

1. Navigate to any task record, such as an incident or change.
2. Click the Start conference call related link.
3. Select one or more Recipients to participate in the conference call.
4. Click Start.
   Any conference call records created from a task are associated with that task. You can view associated conference calls from the task record in the Conference calls related list. You may need to configure the form to add the related list.

Using Notify with incident communication plan

You can use Notify with incident communication plan to send SMS messages or start conference calls based on incident alerts.

Certain configuration steps are required to use Notify with incident communication plan.

- Both Notify and incident communication plan must be active.
- Notify must be configured and able to initiate and receive phone calls and SMS messages.
- The property com.snc.iam.notify_number must be set to an active Notify number.
- This Notify number must belong to a number group configured with inbound and outbound conference call workflows.

**Note:** The Conference Call Group number group is configured with conference call workflows by default.

Numbers and number groups

Number groups allow you to group Notify phone numbers and share workflows across grouped numbers.
Each phone number within Notify has an associated number group. Numbers within a group use the same workflows for handling incoming and outgoing calls and SMS messages. Numbers associated with a group appear on the Notify Phone Numbers related list on the Notify Phone Number Group form.

Launch a conference call from an incident communication plan

As part of processing an incident communication plan, a conference call can be created between involved users.

Call participants can include:

- Those users who have been assigned specific responsibilities.
- Any required ad-hoc user contacts.
- Other involved parties who are not recorded as users, such as third-party contacts.

**Note:** Only one conference call at a time can be active for each incident.

1. Navigate to Incident Management Open.
2. Open the relevant incident communication plan.
3. Click the Initiate Conference Call related link.
4. Within the dialog box that appears, select the participants for the conference.
Figure 200: Select participants

The dialog box displays the recommended and selected participants for the conference. All users from the User Contacts list in the incident communication plan are selected by default. The Recommended section no longer displays the frequently called participants as the frequent callers may not always be relevant for the incident. In the Selected section, the user who initiates the conference call is added to the selected list of participants.

If a rotation schedule exists for the group contacts, the primary and secondary on-call resources are shown in the Recommended list. This way, the current on-call persons can quickly be invited to join the conference call. Calls are placed to the number in the Mobile phone field on the user record. If that
information is blank, the user cannot be contacted through Notify. The mobile phone number has to be an E.164 compliant phone number. If the phone number is a local number, without the + prefix, the number will be retrieved based on the user's location and, if possible, converted into a valid E.164 number.

5. To select ad-hoc participants, do one of the following:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Click the reference lookup icon, and select the relevant user.</td>
<td>Click Add to selected.</td>
</tr>
<tr>
<td>Enter the participant's phone number in the field beside the telephone icon.</td>
<td>Click Add to selected.</td>
</tr>
</tbody>
</table>

6. After the participant list is finalized, click OK.

The conference call starts and a Conference call initiated message is displayed at the top of the incident communication plan form. Each user is called and can accept the call to join the conference. Several response types are possible from users invited to join the conference call, apart from Accepted.

7. Click the Conference call initiated message to see details of that conference call.

When the final participant leaves the conference, the conference call closes.

**Note:** VoIP phone systems, which do not use touch tone phones, may encounter issues with recognizing key presses. To avoid problems, ensure that conference call users use touch tone phones, or configure your VoIP system settings to recognize key presses, as described in your VoIP system documentation.

---

**Viewing conference call information**

Conference calls are listed as system activities in the Activity section of the Incident Communication Plan form and also are listed in the Conference Calls related list.
Figure 201: Conference bridge history
Send an SMS notification for an incident communications plan

Notify sends an SMS to the users defined as default contacts for the alert.

When you create a new incident communication plan, Notify sends an SMS notification to the users defined as default contact responsibilities for the alert.

This text message is sent to the user's mobile phone number: IA<number>: a <Severity> severity <Event Type> incident communication plan for <CI Name> has been opened.

Administrators can modify the content of this message by editing the SMS on new Incident Communication Plan business rule.

Using Notify with on-call scheduling

When using both Notify and On-call scheduling you can send scheduling notifications as SMS messages, in addition to emails.

Certain configuration steps are required to use Notify with On-call scheduling.

• You must add at least one Notify phone number to the On-Call Group number group. This group is configured by default to handle inbound SMS responses that accept or reject an on-call assignment.
• You must configure any outbound SMS workflows, such as the On-Call: Assign by Acknowledgement workflow to use this Notify phone number to send SMS messages. Edit all Send SMS activities in these workflows to use this number as the From value.

Set up Notify with on-call scheduling

You can configure on-call scheduling to use Notify functionality to send SMS alerts and assign users to tasks based on the SMS responses.

Ensure that the Notify and On-Call Scheduling plugins on your instance are activated.

Role required: admin

Set up Notify with On-call scheduling for the first time or migrate from On-call scheduling with NotifyNow.

1. Navigate to Notify Numbers.
2. Select the phone number you want to use to send and receive on-call scheduling messages.
3. In the Notify group field, select the On-Call Group.
   The On-Call Group is configured with the on-call workflow by default.
4. Navigate to Workflow Workflow Editor.
5. Select the On-Call: Assign by Acknowledgement workflow.
   If migrating from NotifyNow, and you have previously customized this workflow, you must import the new version of the workflow manually. See KB0551603 for more information.
6. Click the workflow menu icon in the title bar and select Copy to copy the On-Call: Assign by Acknowledgement workflow. Save the copied workflow under a different name than what it is named by default.

   Note: You must avoid modifying default workflows and instead choose to copy and then modify the required workflow.

7. Select a Send SMS activity.
8. In the To (script) field, modify the getRecipientsAndNumberToSendFrom() function and uncomment the line //notify_number : getNotifyNumber().
9. Perform one of the following actions.
<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify a static number</td>
<td>Within the getRecipientsAndNumberToSendFromChange() function, change getNotifyNumber() to the sys_id of the Notify phone number you selected in step 2.</td>
</tr>
<tr>
<td>Specify a number procedurally</td>
<td>Update the getNotifyNumber() function to return the sys_id of the Notify phone number you selected in step 2.</td>
</tr>
</tbody>
</table>

10. Repeat the previous 2 steps for each Send SMS activity on the workflow.
11. Click the workflow actions icon and select Publish.
12. Close the Workflow Editor interface.
13. Navigate to On-Call Scheduling Trigger Rules.
14. Select a trigger rule that launches an assignment workflow.
15. In the Trigger action field, select Workflow.
16. In the Trigger workflow field, select the On-call: Assign by Acknowledgement workflow.
17. Click Update.
18. Repeat the previous 3 steps for each assignment trigger rule.

Each time the conditions for one of these trigger rules is met, the On-call: Assign by Acknowledgement workflow runs.

Using the on-call: assign by acknowledgement workflow

The On-Call: Assign by Acknowledgement workflow is provided with Notify.

The workflow uses data from the escalation settings of rotas and rosters. Depending on these settings, the workflow iterates through the defined escalation chain and sends notifications by SMS or email to users asking them for incident assignment. The workflow respects time-off as specified in the rosters. People who have time-off are not included in the escalation chain and no notifications are sent to them.

When you install both On-call scheduling and Notify, the message_number column is added to the Notify Messages [notify_messages] table to track responses to on-call assignment requests. This column indicates if the contacted user accepted or rejected the assignment. Before you can send notifications, you must define trigger rules. Trigger rules determine the conditions that must be met before a notification is sent and what action must be taken.

Controlling the on-call communication channel with Notify

You can configure On-call scheduling with Notify to always use a user’s preferred communication channel.

If Force communication channel is specified in the Escalation settings for rosters, the preferred user device is used, either SMS or email.

If the preferred device is SMS, and the on-call member does not have an SMS device defined, the user is not contacted even if the user has an email address. When forcing a communication channel on an escalation level does not succeed, no further communication attempts are made. The fact that the user could not be reached is logged.

The setting Force communication channel is only available if Notify is installed.

Key differences between on-call scheduling with NotifyNow and with Notify

There are key differences between on-call scheduling with NotifyNow and on-call scheduling with Notify.
Tracking responses to questions

The On call: Assign by Acknowledgement workflow no longer uses the Notify Question tables to track assignment responses. When you install On-call scheduling with Notify, the message_number column is added to the Notify Messages [notify_messages] table to track responses to on-call assignment requests. This column indicates if the contacted user accepted or rejected the assignment.

Scripting Notify

You can use scripts with Notify to interact with calls and SMS messages, or to provide a custom client interface.

Notify

The Notify API allows you to interact with Notify calls and SMS messages using scripts.

Notify - getPhoneNumbers()

Returns all phone numbers and short codes available to Notify, as an array.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 189: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Array</td>
<td>An array of NotifyPhoneNumber objects, each object representing one phone number available to Notify.</td>
</tr>
</tbody>
</table>

```javascript
// instantiate notify
var notify = new SNC.Notify();

// get all available phone numbers
var phoneNumbers = notify.getPhoneNumbers();

// iterate over phone numbers
for (var i = 0; i < phoneNumbers.size(); i++) {
    var number = phoneNumbers.get(i);
    //perform any actions using each phone number
}
```

Notify - getShortCodes()

Returns all short codes available to Notify, as an array.
### Table 190: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 191: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Array</td>
<td>An array of NotifyPhoneNumber objects, each object representing one short code available to Notify.</td>
</tr>
</tbody>
</table>

```javascript
// instantiate notify
var notify = new SNC.Notify();

// get all available shortcodes
var shortCodes = notify.getShortCodes();

// iterate over phone numbers
for (var i = 0; i < shortCodes.size(); i++) {
  var shortCode = shortCodes.get(i);
  gs.log(shortCode.getNumber());
  //perform any actions using each shortcode
}
```

### Notify - call(String notifyPhoneNumber, String toPhoneNumber)

Make a call to an E.164-compliant phone number.

#### Table 192: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>notifyPhoneNumber</td>
<td>String</td>
<td>The phone number to make the call from. This number appears as the caller ID.</td>
</tr>
<tr>
<td>toPhoneNumber</td>
<td>String</td>
<td>The phone number to call.</td>
</tr>
</tbody>
</table>

```javascript
var from = '+14048007337';
var to = '+31646810495';
```
Notify - call(String notifyPhoneNumber, String toPhoneNumber, GlideRecord conferenceCall)

Call a number to add that number to an active conference call.

This method is intended specifically for conference calls. To initiate calls between only two participants, use the call(String notifyPhoneNumber, String toPhoneNumber) method instead.

Table 194: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>notifyPhoneNumber</td>
<td>String</td>
<td>The Notify phone number to make the call from. When you initiate a call, the outgoing call workflow for the number group associated with this number runs. Ensure this workflow includes a join conference call activity to connect the user to the conference call.</td>
</tr>
<tr>
<td>toPhoneNumber</td>
<td>String</td>
<td>The phone number to call. Called numbers are added to the conference call.</td>
</tr>
<tr>
<td>conferenceCall</td>
<td>GlideRecord</td>
<td>A GlideRecord for the Notify Call [notify_call] table identifying the conference call record. This record is automatically added to the outgoing call workflow scratchpad as the workflow.scratchpad.conference_call variable.</td>
</tr>
</tbody>
</table>

Table 195: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></td>
</tr>
</tbody>
</table>

```javascript
var notify = new SNC.Notify();
var from = '+14041234567';
var participants = ['+31612345678', '+31623456789', '+31687654321'];

// set up a conference call
var conferenceCall = notify.conferenceCall();

// set up the outbound calls for all conference call participants
for (var i in participants) {
```
var to = participants[i];
    notify.call(from, to, conferenceCall);
}

// feedback
gs.log(gs.getMessage('set up a conference call with number {0} and (re)join code: {1}',
    [ conferenceCall.getValue('number'),
    conferenceCall.getValue('code') ]));

Notify - sendSMS(NotifyPhoneNumber notifyPhoneNumber, String toPhoneNumber, String messageBody)

Sends an SMS text message to an E.164-compliant phone number.
This function creates a new record on the Notify Message [notify_message] table.

Table 196: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>notifyPhoneNumber</td>
<td>NotifyPhoneNumber</td>
<td>The Notify phone number or short code to send this SMS from.</td>
</tr>
<tr>
<td>toPhoneNumber</td>
<td>String</td>
<td>An E.164-compliant phone number to send the SMS to.</td>
</tr>
<tr>
<td>messageBody</td>
<td>String</td>
<td>The SMS text.</td>
</tr>
</tbody>
</table>

Table 197: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>The sys_id of the Notify Message [notify_message] record created by this function.</td>
</tr>
</tbody>
</table>

Notify - sendSMS(NotifyPhoneNumber notifyPhoneNumber, String toPhoneNumber, String messageBody, GlideRecord source)

Sends an SMS text message to an E.164-compliant phone number.
This function creates a new record on the Notify Message [notify_message] table and associates it with the source record.

Table 198: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>notifyPhoneNumber</td>
<td>NotifyPhoneNumber</td>
<td>The Notify phone number or short code to send this SMS from.</td>
</tr>
<tr>
<td>toPhoneNumber</td>
<td>String</td>
<td>An E.164-compliant phone number to send the SMS to.</td>
</tr>
<tr>
<td>messageBody</td>
<td>String</td>
<td>The SMS text.</td>
</tr>
<tr>
<td>Name</td>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>---------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>source</td>
<td>GlideRecord</td>
<td>The source record that prompted this SMS message, such as an incident.</td>
</tr>
</tbody>
</table>

Table 199: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>The sys_id of the Notify Message [notify_message] record created by this function.</td>
</tr>
</tbody>
</table>

Notify - getChildCallIDs(GlideRecord callRecord)

Returns the sys_id values of calls that are children of a specified call.

Any call started by forwarding another call, such as with the Forward workflow activity, is considered a child of the original call. The original call is the parent call.

Table 200: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>callRecord</td>
<td>GlideRecord</td>
<td>A record on the Notify Call [notify_call] table.</td>
</tr>
</tbody>
</table>

Table 201: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Array</td>
<td>The sys_id values of all calls that are children of the specified call.</td>
</tr>
</tbody>
</table>

```javascript
var callRecord = new GlideRecord('notify_call');
callRecord.get("0f4f5863ff13100014ecf4fffffff28");
var notify = new SNC.Notify();
var childCallIDs = notify.getChildCallIDs(callRecord);
for(var callID in childCallIDs)
  //perform any operations with the child callID values
```

Notify - getParentCallID(GlideRecord callRecord)

Returns the sys_id of a specified call's parent call.

Any call started by forwarding another call, such as with the Forward workflow activity, is considered a child of the original call. The original call is the parent call.
Table 202: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>callRecord</td>
<td>GlideRecord</td>
<td>A record on the Notify Call [notify_call] table.</td>
</tr>
</tbody>
</table>

Table 203: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>The sys_id of the parent call record.</td>
</tr>
</tbody>
</table>

```javascript
var callRecord = new GlideRecord('notify_call');
callRecord.get("0f4f5863ff13310014ecfffffffff28");
var notify = new SNC.Notify();
var parentCallID = notify.getParentCallID(callRecord);
```

Notify - getTokens()

Returns client tokens for any installed telephony drivers for use in WebRTC or mobile clients.
This function uses the currently logged-in user record as the client.

Table 204: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 205: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>The client tokens, as a JSON string.</td>
</tr>
</tbody>
</table>

```javascript
// get Notify Client Tokens per active Notify Driver for the currently logged in user
var json = new SNC.Notify().getTokens();

// parse the json that was return into a tokens object
var tokens = JSON.parse(json);

// log line
gs.log('Notify Client Tokens for the currently logged in user');

// iterate over the driver tokens
for (var driver in tokens) {
    gs.log(driver + ' Driver token: ' + tokens[driver]);
    }
```
Notify - getTokens(GlideRecord record)
Get client tokens for any installed telephony drivers for use in WebRTC or mobile clients.

Table 206: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>record</td>
<td>GlideRecord</td>
<td>A record used to generate the client tokens.</td>
</tr>
</tbody>
</table>

Table 207: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>The client tokens. The value of the string depends on the GlideRecord parameter.</td>
</tr>
</tbody>
</table>

This example demonstrates getting Notify client tokens for every Notify group.

```javascript
// instantiate Notify
var notify = new SNC.Notify();

// get all Notify Groups
var notifyGroup = new GlideRecord("notify_group");
notifyGroup.query();

// iterate over all notify groups
while (notifyGroup.next()) {
    // generate Notify Client tokens per active Notify Driver for this group
    var json = notify.getTokens(notifyGroup);
    var tokens = JSON.parse(json);

    for (var driver in tokens) {
        gs.log(gs.getMessage("Notify Client token for {0} driver and Notify Group '{1}': {2}", [driver, notifyGroup.getValue('name'), tokens[driver]]));
    }
}
```

Notify - getAvailableClients(String notifyNumber)
Returns a list of client sessions that are available to receive calls.

Table 208: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>notifyNumber</td>
<td>String</td>
<td>Any valid Notify phone number.</td>
</tr>
</tbody>
</table>
Table 209: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Array</td>
<td>An array of JSON objects with the following format:</td>
</tr>
<tr>
<td></td>
<td>```</td>
</tr>
<tr>
<td></td>
<td>[{ sys_id: &quot;...&quot;, // user's sys_id</td>
</tr>
<tr>
<td></td>
<td>name: &quot;...&quot; // user's name }</td>
</tr>
<tr>
<td></td>
<td>}</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notify - conferenceCall()

Create a new conference call GlideRecord.

Table 210: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 211: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GlideRecord</td>
<td>A new Notify Call [notify_call] record for a</td>
</tr>
<tr>
<td></td>
<td>conference call.</td>
</tr>
</tbody>
</table>

```javascript
var notify = new SNC.Notify();
var from = '+14041234567';
var participants = ['+31612345678', '+31623456789', '+31687654321'];

// set up a conference call
var conferenceCall = notify.conferenceCall();

// set up the outbound calls for all conference call participants
for (var i in participants) {
  var to = participants[i];
  notify.call(from, to, conferenceCall);
}

// feedback
gs.log(gs.getMessage('set up a conference call with number {0} and (re)join code: {1}',
  [ conferenceCall.getValue('number'),
    conferenceCall.getValue('code') ]));
```

Notify - queueCall(GlideRecord callRecord)

Put a call into a queue.

Resume a queued call using the dequeueCall method.
Table 212: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>callRecord</td>
<td>GlideRecord</td>
<td>A GlideRecord object on the Notify Call [notify_call] table with the call you want to put on hold.</td>
</tr>
</tbody>
</table>

Table 213: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></td>
</tr>
</tbody>
</table>

    var call = new GlideRecord('notify_call');
    call.get('<call record sys_id>');
    if (call.isValid()) {
        new SNC.Notify().queueCall(call);
    }

Notify - dequeueCall(GlideRecord callRecord)

Resume a call after it was put in a queue.
Use this method to resume calls that were put in a queue with the queueCall method.

Table 214: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>callRecord</td>
<td>GlideRecord</td>
<td>A GlideRecord object on the Notify Call [notify_call] table with the held call you want to resume.</td>
</tr>
</tbody>
</table>

Table 215: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></td>
</tr>
</tbody>
</table>

    var call = new GlideRecord('notify_call');
    call.get('some sys_id');
    if (call.isValid()) {
        new SNC.Notify().dequeueCall(call);
    }

Notify - kick(GlideRecord participant)

Kick a specified user from a Notify conference call.
<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>participant</td>
<td>GlideRecord</td>
<td>A GlideRecord object containing the Notify Participant [notify_participant] to kick from the conference call.</td>
</tr>
</tbody>
</table>

Table 217: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></td>
</tr>
</tbody>
</table>

```
var participant = new GlideRecord('notify_participant');
participant.get('<sys_id>');
if (participant.isValid()) {
    new SNC.Notify().kick(participant);
}
```

Notify - forwardCall(GlideRecord call, String destination, String dtmf)

Forward a call to connect that call with a different recipient.

Table 218: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>call</td>
<td>GlideRecord or String</td>
<td>A Notify call record, or the telephony provider call ID.</td>
</tr>
<tr>
<td>destination</td>
<td>GlideRecord or String</td>
<td>A Notify phone number record, or an E.164-compliant phone number.</td>
</tr>
<tr>
<td>dtmf</td>
<td>String</td>
<td>A DTMF code to play upon connection.</td>
</tr>
</tbody>
</table>

Table 219: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></td>
</tr>
</tbody>
</table>

NotifyAction

The NotifyAction API allows you to define actions to send to a telephony provider.

You add actions to a NotifyAction object by calling the respective add function for each type of action.

Each add function returns an Action object, such as a SayAction object for the addSay() function. Refer to each method example for information about returned objects.
NotifyAction - `addDial()`

Makes an outbound call.

### Table 220: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 221: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DialAction</td>
<td>The action added to the NotifyAction object. Use the DialAction object to define.</td>
</tr>
</tbody>
</table>

```javascript
var action = new SNC.NotifyAction();
var dial = action.addDial();
dial.setRecord(activity.vars.record);
dial.setClientRecord(activity.vars.user, "sys_user");
```

NotifyAction - `addGather()`

Presents an interactive phone menu to the user.

### Table 222: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 223: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GatherAction</td>
<td>The action added to the NotifyAction object. Use the GatherAction object to define the menu settings and options to present to the user.</td>
</tr>
</tbody>
</table>

```javascript
// instantiate NotifyAction
var notifyAction = new SNC.NotifyAction();

// present the user with a menu
var gather = notifyAction.addGather();
gather.setNumberOfDigits(1); // the user can type 1 digit
gather.setFinishKey('#');    // # or *, useful for > 1 digits
gather.setTimeout(10);       // time to enter answer, in seconds

// add first menu item
var usSay = gather.addSay();
usSay.setText('Press 1 for english');
usSay.setLanguage('en-US');

// add second menu item
var nlSay = gather.addSay();
nlSay.setText('Kies 2 voor Nederlands');
nlSay.setLanguage('nl-NL');

// add third menu item
var frSay = gather.addSay();
frSay.setText('Choisissez 3 pour le français.');
frSay.setLanguage('fr-FR');

// and finish off with an applause
var play = gather.addPlay();
play.setURL('http://www.wavsource.com/
snds_2015-04-12_5971820382841326/sfx/applause_y.wav');

### NotifyAction - addHangUp()

Ends an active phone call.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HangUpAction</td>
<td>The action added to the NotifyAction object.</td>
</tr>
</tbody>
</table>

// instantiate NotifyAction
var notifyAction = new SNC.NotifyAction();

// hang up
notifyAction.addHangUp();

### NotifyAction - addQueue()

Queue the call, putting it on hold.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Table 227: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>QueueAction</td>
<td>The action added to the NotifyAction object. Use the QueueAction object to define the queue name, and queueing or dequeueing behavior.</td>
</tr>
</tbody>
</table>

// instantiate NotifyAction
var notifyAction = new SNC.NotifyAction();

// queue the call
var queue = notifyAction.addQueue();
queue.setName('my queue');

// instantiate NotifyAction
var notifyAction = new SNC.NotifyAction();

// dequeue the call
var queue = notifyAction.addQueue();
queue.setDequeue(true);

NotifyAction - addPlay()

Plays an audio file on the call.

Table 228: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 229: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PlayAction</td>
<td>The action added to the NotifyAction object. Use the PlayAction object to define the audio file URL and number of times to loop the audio.</td>
</tr>
</tbody>
</table>

// instantiate NotifyAction
var notifyAction = new SNC.NotifyAction();

// add a play action
var play = notifyAction.addPlay();
play.setURL('http://www.moviesounds.com/2001/imsorry.wav');
play.setLoop(1);

NotifyAction - addReject()

Rejects an incoming call.
Table 230: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 231: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RejectAction</td>
<td>The action added to the NotifyAction object. Use the RejectAction object to define the reason for rejecting the call.</td>
</tr>
</tbody>
</table>

```javascript
// instantiate NotifyAction
var notifyAction = new SNC.NotifyAction();

// reject the call
var rejectAction = notifyAction.addReject();
rejectAction.setReason('busy'); // 'busy' or 'rejected'
```

**NotifyAction - addSay()**

Use text-to-speech to read text on the call.

Multiple languages are supported with text-to-speech. Available languages depend on the telephony provider.

Table 232: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 233: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SayAction</td>
<td>The action added to the NotifyAction object. Use the SayAction object to define the text and language to read.</td>
</tr>
</tbody>
</table>

This example demonstrates reading text in several languages.

```javascript
// instantiate NotifyAction
var notifyAction = new SNC.NotifyAction();

// add a say action to say something in US English
var usSay = notifyAction.addSay();
usSay.setText('Welcome. I can speak english');
usSay.setLanguage('en-US');
```
// add a say action to say something in Dutch
var nlSay = notifyAction.addSay();
nlSay.setText('Ik spreek ook vloeiend nederlands');
nlSay.setLanguage('nl-NL');

// and german
var deSay = notifyAction.addSay();
deSay.setText('Und ich kan auch deutsch sprechen');
deSay.setLanguage('de-DE');

NotifyAction - addSMS()

Sends an SMS message.

When using this function with an active call, you do not need to call the setTo function on the returned SMSAction object. The SMS is automatically sent to the caller.

Table 234: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 235: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMSAction</td>
<td>The action added to the NotifyAction object. Use the SMSAction object to define the message text and the phone number to send the message to.</td>
</tr>
</tbody>
</table>

// instantiate NotifyAction
var notifyAction = new SNC.NotifyAction();

// define where to send the sms to
var number = new GlideElementPhoneNumber();
number.setPhoneNumber('+31612345678', true);

// add a SMS action
var sms = notifyAction.addSMS();
sms.setMessage('Lorem ipsum dolor sit amet, consectetur adipiscing elit.');
sms.setTo(number);

NotifyAction - fromJson(String json)

Deserialize a NotifyAction object from a JSON string.

Table 236: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>json</td>
<td>String</td>
<td>A JSON string representation of a NotifyAction object.</td>
</tr>
</tbody>
</table>
This example demonstrates deserializing a NotifyAction object.

```javascript
var json = ".... some json obtained from toJson ....";

// instantiate notify action
var notifyAction = new SNC.NotifyAction();

// deserialize and reconstruct the notify action instance
notifyAction.fromJson(json);
```

This example demonstrates both serializing and deserializing a NotifyAction object.

```javascript
// instantiate notify action
var notifyAction = new SNC.NotifyAction();

// add a queue
var queue = notifyAction.addQueue();
queue.setName('myQueueName');
queue.setDequeue(false);

// serialize to json
var json = notifyAction.toJson();
gs.log('serialization result: ' + json);

// instantiate a new notify action
var newAction = new SNC.NotifyAction();

// deserialize the json generated above
newAction.fromJson(json);

// serialize the new object and log the result
newJson = newAction.toJson();
gs.log('new serialization result: ' + newJson);
gs.log('the same: ' + (json == newJson));
```

Output: *** Script: serialization result: "{"fClassName":"NotifyAction","fActions": [{"fClassName":"QueueAction","fDequeue":false,"fQueueName":"myQueueName"}]}
*** Script: new serialization result: "{"fClassName":"NotifyAction","fActions": [{"fClassName":"QueueAction","fDequeue":false,"fQueueName":"myQueueName"}]}
*** Script: the same: true

**NotifyAction - toJson()**

Serialize the NotifyAction object to a JSON string.

### Table 237: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></td>
</tr>
</tbody>
</table>

### Table 238: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 239: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>A JSON representation of this NotifyAction object.</td>
</tr>
</tbody>
</table>

This example demonstrates serializing a NotifyAction object.

```javascript
// instantiate notify action
var notifyAction = new SNC.NotifyAction();

// add one or more notify actions
// ...

// and serialize to json
var json = notifyAction.toJson();
```

This example demonstrates both serializing and deserializing a NotifyAction object.

```javascript
// instantiate notify action
var notifyAction = new SNC.NotifyAction();

// add a queue
var queue = notifyAction.addQueue();
queue.setName('myQueueName');
queue.setDequeue(false);

// serialize to json
var json = notifyAction.toJson();
gs.log('serialization result: ' + json);

// instantiate a new notify action
var newAction = new SNC.NotifyAction();

// deserialize the json generated above
newAction.fromJson(json);

// serialize the new object and log the result
newJson = newAction.toJson();
gs.log('new serialization result: ' + newJson);
gs.log('the same: ' + (json == newJson));

Output: *** Script: serialization result: {"fClassName":"NotifyAction","fActions": [{"fClassName":"QueueAction","fDequeue":true,"fQueueName":"myQueueName"}]}
***
** Script: new serialization result: {"fClassName":"NotifyAction","fActions": [{"fClassName":"QueueAction","fDequeue":true,"fQueueName":"myQueueName"}]}
***
** Script: the same: true
```

### NotifyAction - addConference()

Add a call to a Notify conference call.
Table 240: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 241: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ConferenceAction</td>
<td>The action added to the NotifyAction object. Use the ConferenceAction object to define the conference call name, and the behavior of the conference call when a participant joins or leaves.</td>
</tr>
</tbody>
</table>

**NotifyPhoneNumber**

The NotifyPhoneNumber API allows you to query information about a Notify phone number.

**NotifyPhoneNumber - getDialCode()**

Returns the international dialing code for a Notify phone number.

Table 242: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 243: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>International phone code for a country.</td>
</tr>
</tbody>
</table>

**NotifyPhoneNumber - getID()**

Returns the ID of this phone number as defined by the telephony provider.

Table 244: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 245: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>The ID of the number within the telephony provider.</td>
</tr>
</tbody>
</table>

NotifyPhoneNumber - getNumber()

Returns the numerical phone number for a NotifyPhoneNumber.

Table 246: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 247: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>An E.164-compliant phone number.</td>
</tr>
</tbody>
</table>

NotifyPhoneNumber - getOwner()

Returns the telephony provider associated with this phone number.

Table 248: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 249: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td>The telephony provider associated with the number: Twilio.</td>
</tr>
</tbody>
</table>

NotifyPhoneNumber - getTerritory()

Returns the country associated with the phone number.

Table 250: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 251: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>The name of the country the phone number belongs to.</td>
</tr>
</tbody>
</table>

**NotifyPhoneNumber - supportsConferenceCall()**

Determines if the Notify phone number supports conference calling.

Table 252: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 253: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>boolean</td>
<td>Returns true if the Notify phone number supports conference calling.</td>
</tr>
</tbody>
</table>

**NotifyPhoneNumber - supportsIncomingPhoneCall()**

Determines if the Notify phone number supports receiving phone calls.

Table 254: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 255: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>boolean</td>
<td>Returns true if the Notify phone number supports receiving incoming phone calls.</td>
</tr>
</tbody>
</table>

**NotifyPhoneNumber - supportsIncomingSMS()**

Determines if the Notify phone number supports receiving SMS messages.

Table 256: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 257: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>boolean</td>
<td>Returns true if the Notify phone number supports receiving incoming MMS messages.</td>
</tr>
</tbody>
</table>

**NotifyPhoneNumber - supportsOutgoingPhoneCall()**

Determines if the Notify phone number supports initiating phone calls.

### Table 258: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 259: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>boolean</td>
<td>Returns true if the Notify phone number supports initiating outgoing phone calls.</td>
</tr>
</tbody>
</table>

**NotifyPhoneNumber - supportsOutgoingSMS()**

Determines if the Notify phone number supports sending SMS messages.

### Table 260: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 261: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>boolean</td>
<td>Returns true if the Notify phone number supports sending SMS messages.</td>
</tr>
</tbody>
</table>

**NotifyPhoneNumber - supportsRecording()**

Determines if the Notify phone number supports recording phone calls.

### Table 262: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 263: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>boolean</td>
<td>Returns true if the Notify phone number supports recording phone calls.</td>
</tr>
</tbody>
</table>

**NotifyPhoneNumber - supportsWebRTC()**

Determines if the Notify phone number supports calls to a browser, such as in a WebRTC implementation.

Table 264: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 265: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>boolean</td>
<td>Returns true if the Notify phone number supports calls to a browser.</td>
</tr>
</tbody>
</table>

**Notify Client**

The Notify Client API allows you to use Notify telephony functionality, such as making and receiving calls, from a web browser.

Several Notify Client methods take a callback function as a parameter. Because Notify Client calls are made asynchronously, these methods cannot return a value directly. Use the callback function to parse the returned data, such as by assigning variables or making other API calls.

**Notify Client - Client(Object notifyConfig)**

Instantiates a new Notify WebRTC Client object.

Table 266: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>notifyConfig</td>
<td>Object</td>
<td>The configuration settings for the Notify WebRTC Client, as a JSON object.</td>
</tr>
</tbody>
</table>

```javascript
var notifyConfig = {
    vendor: SNC.Notify.Vendor.TWILIO,
    callerId: 'xyz',
    autoReconnect: true,
    onReady: function() {},
    onOffline: function() {},
```
Notify Client - call(Object identifier)

Call a specified phone number or the phone number associated with a specified user.

Table 267: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>identifier</td>
<td>Object</td>
<td>Enter a JSON object that provides either the phone number to call or the sys_id of a user record to get the phone number from.</td>
</tr>
</tbody>
</table>

**Note:** If you provide both a phone number and user sys_id, only the phone number is used.

Table 268: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></td>
</tr>
</tbody>
</table>

This example demonstrates passing a phone number as the function parameter.

```javascript
notifyClient.call({
    phoneNumber: "+18001112223"
});
```

This example demonstrates passing a user record sys_id as the function parameter.

```javascript
notifyClient.call({
    userId: "6816f79cc0a8016401c5a33be04be441"
});
```
Notify Client - hangupCall()
End the current call.

Table 269: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 270: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></td>
</tr>
</tbody>
</table>

This example demonstrates mapping a client function to an interface button using jQuery.

```
$('[#pickupCallBtn]').on('click', function() {
  notifyClient.hangupCall();
});
```

Notify Client - pickupCall()
Answers and connects to an incoming call from an Twilio WebRTC client.
Call this method when there is a notification of an incoming call.

Table 271: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 272: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></td>
</tr>
</tbody>
</table>

Notify Client - mute(Boolean muted)
Mute or unmute the current client.

Table 273: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>muted</td>
<td>Boolean</td>
<td>Set this value to true to mute the current client, false to unmute.</td>
</tr>
</tbody>
</table>
Table 274: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></td>
</tr>
</tbody>
</table>

**NotifyClient - forwardCall(Object argument)**

Forward the current call to a different phone number or Notify client session.

Table 275: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>argument</td>
<td>Object</td>
<td>A JavaScript object detailing the number or Notify client to forward the call to.</td>
</tr>
</tbody>
</table>

Table 276: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></td>
</tr>
</tbody>
</table>

This example demonstrates forwarding a call to a different phone number. The dtmf attribute allows you to send DTMF dial tones to the receiving number.

```javascript
var arg = {
    type: "number",
    id: "+17012345678",
    dtmf: "1234"
}
client.forwardCall(arg);
```

This example demonstrates forwarding a call to a different Notify client.

```javascript
var arg = {
    type: "userId",
    id: "6816f79cc0a8016401c5a33be04be441"
}
client.forwardCall(arg);
```

**NotifyClient - sendDtmf(String digits)**

Send one or more DTMF-valid digits over the current call.

Table 277: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>digits</td>
<td>String</td>
<td>One or more DTMF-valid digits.</td>
</tr>
<tr>
<td>Type</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>void</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notify client event handlers

Notify Client event handlers allow you to define scripted behavior for responding to events from the Twilio telephony service.

**Event handlers**

A communication between the Notify WebRTC Client and a telephony provider is asynchronous. The client function calls, such as `notifyClient.call()` do not wait for a response from the telephony provider. Instead, event handler methods define how to respond to certain events from the telephony provider.

You can create event handler implementations when creating the Notify Client configuration object. Fully define the handlers in the configuration object before instantiating a Notify Client object.

**onReady**

The `onReady` function runs after you call the `init` function on the client object. The `onReady` function indicates that the WebRTC session is ready.

**onOffline**

The `onOffline` function runs if the WebRTC session is not active.

**onError**

The `onError` function runs if the client encounters an error.

This function exposes one parameter. Use this parameter when implementing the event handler function.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>message</td>
<td>String</td>
<td>The error message text.</td>
</tr>
</tbody>
</table>

**onConnect**

The `onConnect` function runs when the client receives a call connection event for an incoming or outgoing call.

This function exposes one parameter. Use this parameter when implementing the event handler function.
Table 280: Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>status</td>
<td>String</td>
<td>The call status, as a string constant.</td>
</tr>
</tbody>
</table>

Optional: When evaluating call status, use the constants provided by SNC.Notify.Status.

onConnect: function(status) {
  // webRTC receives a call connection event (incoming or outgoing).
  if (status == SNC.Notify.Status.OPEN) {
    setStatus(getTimeStamp() + " -- Successfully established call");
    showHangupButton(); // update the UI
  }
}

onDisconnect

The onDisconnect function runs when a call disconnects.

onIncoming

The onIncoming function runs when a call is made to the client and the telephony provider returns the parent call ID.

This function exposes these parameters as a single JSON object. Use these parameters when implementing the event handler function.

Table 281: Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>callInfo.from</td>
<td>String</td>
<td>The caller's phone number.</td>
</tr>
<tr>
<td>callInfo.to</td>
<td>String</td>
<td>The called phone number.</td>
</tr>
<tr>
<td>callInfo.callSid</td>
<td>String</td>
<td>The SID of the call from the telephony provider.</td>
</tr>
</tbody>
</table>

onIncoming: function(callInfo) {
  gs.log('incoming call from : ' + callInfo.from);
  var gru = new GlideRecord('sys_user');
  gru.addQuery('phone', callInfo.from);
  gru.query(function() {
    while (gru.next()) { // there may be more than one person with same number?
      // fetch caller's info
      gs.log('caller : ' + gru.name);
    }
  });
}
**onOutgoing**

The `onOutgoing` function runs when an outgoing call is made from the client. This function exposes one parameter. Use this parameter when implementing the event handler function.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>callSid</td>
<td>String</td>
<td>The SID of the call from the telephony provider.</td>
</tr>
</tbody>
</table>

**onAccept**

The `onAccept` function when the client accepts an incoming call.

**onMute**

The `onMute` function runs when the client is muted.

**onUnmute**

The `onUnmute` function runs when the client is unmuted.

**onCancel**

The `onCancel` function runs if the caller cancels the call.

**Notify client building a configuration object example**

This example demonstrates how to construct the configuration object needed to instantiate a Notify WebRTC Client object.

The configuration object is a JSON object that specifies properties such as the telephony service provider and caller information, and event handler functions.

This sample code demonstrates how to create a simple configuration object.

```javascript
var notifyConfig = {
    vendor: SNC.Notify.Vendor.TWILIO, //Pass one of the supported vendor constants. Supported value is SNC.Notify.Vendor.TWILIO. Do not pass raw string values.
    callerId: '19991231234', //Pass a valid phone number to use as the caller ID. This number is usually provided by your telephony vendor.
    autoReconnect: true, //Pass true to automatically create a new WebRTC vendor session when the current session expires.
    onReady: function() {},
    onOffline: function() {},
    onError: function( message ) {},
    onConnect: function( status ) {},
    onDisconnect: function() {},
    onIncoming: function( {from, to, callSid} ) {},
    onOutgoing: function( callSid ) {};
};
```
Components installed with Notify

Several types of components are installed with the Notify application.

Roles installed with Notify

Notify adds the following roles.

<table>
<thead>
<tr>
<th>Role title [name]</th>
<th>Description</th>
<th>Contains roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notify administrator [notify_admin]</td>
<td>Administrator with privileges for Notify 2 functionality.</td>
<td>workflow_admin • workflow_creator • workflow_publisher</td>
</tr>
<tr>
<td>Notify viewer [notify_view]</td>
<td>Can view notify content. This role has read-only access to the Notify Conference Calls table [notify_conference_call] and the Notify Conference Call Participants table [notify_participant]. The itil role inherits the notify_view role when the Incident Communications Management and the Notify plugins are activated.</td>
<td></td>
</tr>
</tbody>
</table>

Tables installed with Notify

Notify adds the following tables.

Table 283: Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notify Conference Calls [notify_conference_call]</td>
<td></td>
</tr>
<tr>
<td>Notify Calls [notify_call]</td>
<td></td>
</tr>
<tr>
<td>Notify Call Queue [notify_queue]</td>
<td></td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Notify Call Status</td>
<td></td>
</tr>
<tr>
<td>[notify_call_status]</td>
<td></td>
</tr>
<tr>
<td>Notify Client Connected Sessions</td>
<td></td>
</tr>
<tr>
<td>[notify_client_session]</td>
<td></td>
</tr>
<tr>
<td>Notify Conference Calls</td>
<td></td>
</tr>
<tr>
<td>[notify_conference_call]</td>
<td></td>
</tr>
<tr>
<td>Notify Conference Call Participants</td>
<td></td>
</tr>
<tr>
<td>[notify_participant]</td>
<td></td>
</tr>
<tr>
<td>Notify Conference Call Participant Sessions</td>
<td></td>
</tr>
<tr>
<td>[notify_participant_session]</td>
<td></td>
</tr>
<tr>
<td>Notify Messages</td>
<td></td>
</tr>
<tr>
<td>[notify_message]</td>
<td></td>
</tr>
<tr>
<td>Notify Phone Numbers</td>
<td></td>
</tr>
<tr>
<td>[notify_number]</td>
<td></td>
</tr>
<tr>
<td>Notify Phone Number Groups</td>
<td></td>
</tr>
<tr>
<td>[notify_group]</td>
<td></td>
</tr>
<tr>
<td>Notify Languages</td>
<td>A list of the languages that Notify supports when using text-to-speech workflow activities.</td>
</tr>
<tr>
<td>[notify_language]</td>
<td></td>
</tr>
<tr>
<td>Notify Recordings</td>
<td></td>
</tr>
<tr>
<td>[notify_recording]</td>
<td></td>
</tr>
<tr>
<td>Notify Workflow Activity</td>
<td></td>
</tr>
<tr>
<td>[notify_wf_activity]</td>
<td></td>
</tr>
<tr>
<td>Notify Audio MIME Types</td>
<td></td>
</tr>
<tr>
<td>[notify_mime_type]</td>
<td></td>
</tr>
<tr>
<td>TemporarySerialized Notify Action Cache</td>
<td></td>
</tr>
<tr>
<td>[notify_action]</td>
<td></td>
</tr>
<tr>
<td>Notify SMS Template</td>
<td>Contains the templates which are used while sending a notify sms.</td>
</tr>
<tr>
<td>[notify_sms_template]</td>
<td></td>
</tr>
</tbody>
</table>
Properties installed with Notify

Notify adds the following properties.

Table 284: Properties for Notify

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sn_twilio_driver.max_conference_participants</td>
<td>Twilio max limit for number of participants in the conference call.</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
</tr>
<tr>
<td>com.snc.iam.notify_number</td>
<td>The Notify number to use for conference calls.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This number needs to have a group configured with conference call workflows.</td>
</tr>
<tr>
<td>glide.notify.task.phone_number</td>
<td>Notify phone number used for sending SMS-s and starting conference calls from any record that belongs to the task table (or table that extends task table). The number must be entered in E.164-compliant format.</td>
</tr>
<tr>
<td>glide.notify.sms.max_concatenation</td>
<td>Maximum number of concatenated messages to receiver mobile phone.</td>
</tr>
</tbody>
</table>

**Business rules installed with Notify**

Notify adds the following business rules.

<table>
<thead>
<tr>
<th>Business rule</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Call Workflows for Shortcodes</td>
<td>[notify_group]</td>
<td>Checks and displays an error if the call is being triggered by a short code.</td>
</tr>
<tr>
<td>Update Call Active State</td>
<td>[notify_call_status]</td>
<td>Updates the status of the call in notify_call_status with the status received from Twilio.</td>
</tr>
<tr>
<td>Update Conference Call Active State</td>
<td>[notify_participant]</td>
<td>Updates the active flag in notify_participant table. Also calculates the duration when the call is ended by a participant.</td>
</tr>
<tr>
<td>Update Participant Active State</td>
<td>[notify_participant_session]</td>
<td>Updates the active flag for the participant (notify_participant), and calculates the total time on the call upon disconnecting from the call.</td>
</tr>
<tr>
<td>Update Participant Session Active State</td>
<td>[notify_call]</td>
<td>Synchronizes the state of the call between notify_call and notify_participant_session. Upon disconnecting from the call, updates notify_participant_session with the duration of the call.</td>
</tr>
</tbody>
</table>

**Legacy Notify**

Legacy Notify enables organizations with a Twilio account to send notifications using text and voice messages.
Legacy Notify also allows conference calls between ServiceNow users to enable quick communications.

When Legacy Notify is active, you can configure ServiceNow to automatically generate and send notifications to selected contacts, for instance when a new incident communication plan is raised in the incident communications management process.

Users with the notifynow_admin role can set properties and monitor message and conference call activities.

Legacy Notify has been implemented for use within Incident Communications Management. Refer to the Notify API documentation for details on how to implement Legacy Notify for use within other ServiceNow applications.

### Working with Legacy Notify

Follow this process to enable and use Notify.

1. Set up a Twilio account to provide phone connectivity for Notify.
2. Activate Notify.
3. Configure Notify to use Twilio.
4. Begin using Notify immediately within Incident Communications Management.
5. Use the Notify API with other ServiceNow applications to provide SMS, voicemail, email, and conference calls for those applications.

### View a Legacy Notify question

Questions contain a response action and a set of response choices. Use these questions to simplify communications. Then, you can monitor the resulting communication thread.

Role required: notifynow_admin

For example, the process can be used to ask members of a specific on-call group to acknowledge or reject an incident. Depending on the answer from the first team member, the incident is assigned to that person or an SMS question is sent to the next on-call member. In this example, the questions are used as part of a workflow.

To see a list of predefined questions both Notify and On-Call Scheduling need to be active.

1. Navigate to Notify Questions.
2. Click the question On-Call responsibility Accept/Reject to see the question details.
3. Click the Notify Response Choices related list to view or edit the choices. The person who receives the SMS question can either choose to accept or reject the assignment. If the assignment is accepted, the Response action can be that the incident is actually assigned to that person. The response action is a script that you can modify or replace. If the assignment is rejected, an SMS question may be sent to the next person in the escalation chain, and so on. You can combine questions with a workflow to automate a process like on-call scheduling escalation.

Create a question in Legacy Notify

Define a question that can be sent to users.

Role required: notifynow_admin

This content applies only to the Legacy Notify application, available prior to the Geneva release. For information about the Notify application available starting with Geneva, see Notify.

1. Navigate to Notify Questions.
2. Click New.
3. Fill in the fields, as appropriate.
Table 285: Notify New Question form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a description of the question.</td>
</tr>
<tr>
<td>Question</td>
<td>Enter the question you want to send. You can enter variables in the question with the { } tags, for example, {0}. When using more than one variable, use consecutive numbering. When using multiple variables, reference them by specifying their position in the parameter list, starting from {0}. The variable is picked up by the script and translated into, for example, an incident or a problem number.</td>
</tr>
<tr>
<td>Params</td>
<td>Enter parameters which map to the fields on the record that the workflow was triggered for. This enables the message to show dynamic data. Multiple parameters should be separated by a comma. For example, number, shows the incident number in case the workflow was triggered from an incident. A second parameter could be, for example, short_description.</td>
</tr>
<tr>
<td>Response Action</td>
<td>Select the action that must be taken. This is a script that can be modified, or you can create a new script by clicking the search button and selecting New. Several examples of scripts are shown. Write your own script and click Submit.</td>
</tr>
</tbody>
</table>

4. Click Submit.

Create a new response choice in Legacy Notify

Create a new response choice to allow users to select that response for a Notify question.

Role required: notifynow_admin

This content applies only to the Legacy Notify application, available prior to the Geneva release. For information about the Notify application available starting with Geneva, see Notify.

1. Navigate to Notify Questions.
2. Open the notify question you have just created.
3. Click New to create a new notify response choice.
4. Fill in the fields, as appropriate.

Table 286: Notify New Response Choice form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code</td>
<td>The abbreviation for the response choice in the text message. For example, ACC for accept or REJ for reject.</td>
</tr>
</tbody>
</table>
5. Click Submit.

**View Legacy Notify messages**

Applications implementing Notify, such as Incident Communications Management, can send Short Message Service (SMS) text messages to relevant contacts under predefined conditions, such as when a new incident communication plan has been created.

Role required: notifynow_admin

This content applies only to the Legacy Notify application, available prior to the Geneva release. For information about the Notify application available starting with Geneva, see *Notify*.

1. Navigate to Notify Messages.
2. Click a message to see the message details.

![Figure 204: SMS Outbox Details](image)

**View Legacy Notify conversations**

The Notify Conversation [notifynow_conversation] table tracks bi-directional communications and adds the ability to have more than one active conversation with the same phone number at the same time.

Role required: notifynow_admin

This content applies only to the Legacy Notify application, available prior to the Geneva release. For information about the Notify application available starting with Geneva, see *Notify*.

The thread number is combined with the phone number to link the SMS or email response to the correct conversation. Conversations remain active until a response is received or until they are automatically
deactivated after the thread release time runs out. The default thread release time is 10 days. To change this value, add the \texttt{nn.thread.release.age} property.

1. Navigate to Notify Conversations.
2. Click a conversation record to see the conversation details.

![Figure 205: Notify Conversation Details](image)

The State of the conversation can have one of the following values:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ended</td>
<td>The conversation has been completed.</td>
</tr>
<tr>
<td>Failed</td>
<td>The conversation has failed.</td>
</tr>
<tr>
<td>Pending</td>
<td>The SMS or email is waiting to be sent.</td>
</tr>
<tr>
<td>Sent</td>
<td>The SMS or email has been sent.</td>
</tr>
<tr>
<td>Unanswered</td>
<td>The SMS or email has not been answered.</td>
</tr>
</tbody>
</table>

\textbf{Note:} The mode of conversation cannot be changed during one conversation thread. For example, you cannot switch between SMS and email during one conversation.

\textbf{View Legacy Notify conference calls}

Applications that use Notify, such as Incident Communications Management, can launch and maintain conference calls between involved parties.

Role required: notifynow_admin

This content applies only to the Legacy Notify application, available prior to the Geneva release. For information about the Notify application available starting with Geneva, see Notify.

1. Navigate to Notify Conference Calls.
   You can also access conference call information from the relevant record, such as the Conference Calls related list in an incident communication plan record.
2. Click a conference call in the list to view details.

![Notify Conference Call Participants](image)

**Figure 206: Notify Conference Call Details**

3. Click the arrow beside the check box to expand a Participant entry. This shows participant session information, including details of the conference calls that the participant has been involved in.

4. Click a Participant name to see more detailed information about that participant.
Legacy public conference calls

A Notify conference call can be public.

**Note:** This content applies only to the Legacy Notify application, available prior to the Geneva release. For information about the Notify application available starting with Geneva, see Notify.

The Private field on the conference call record indicates if a call is private (selected) or public (not selected). By default, all calls created automatically, such as those created through Incident Communications Management, are public. You can create private calls using the Notify API initiateConferenceCall method.

When created, public conference calls generate an associated Code which is sent via SMS to all invited participants. These participants can distribute the code to allow other users to join the public call. An administrator can control the format of the code using the property glide.notifynow.conference_call.code.pattern. Anyone with the code can connect to a public conference call using one of these methods:

- By calling the Twilio phone number and entering the code for that conference call.
- By sending the code in an SMS message to the Twilio phone number. Participants that join a public call this way are considered ad-hoc participants, indicated on the participant record.

**Administrating Legacy Notify**

An administrator can set up Notify, manage Notify properties and conference call participants.

**Note:** This content applies only to the Legacy Notify application, available prior to the Geneva release. For information about the Notify application available starting with Geneva, see Notify.
Configuring legacy Notify to use the Twilio service

Each ServiceNow instance using Notify requires a valid Twilio account and telephone number. Refer to the Twilio documentation for detailed instructions.

Note: This content applies only to the Legacy Notify application, available prior to the Geneva release. For information about the Notify application available starting with Geneva, see Notify.

After the Twilio account is set up, perform the following to use that account with Notify:

• Associate the account with Notify
• Configure Twilio with ServiceNow endpoints

Associate a Twilio account with Legacy Notify

Associate a Twilio account with your instance to use that account for legacy Notify.

Role required: notifynow_admin

This content applies only to the Legacy Notify application, available prior to the Geneva release. For information about the Notify application available starting with Geneva, see Notify.

1. Navigate to Notify Administration Properties.
2. Enter the AccountSID, AuthToken and phone number values. These values can be obtained from the Twilio dashboard:

![Figure 208: Notify Properties](image-url)
When the Twilio account details are entered in the Notify Properties page, the account status is updated.

3. [Optional] To use Notify on multiple ServiceNow instances, activate Notify on each instance and create a separate Twilio account and telephone number for each instance.

**Note:** Some telephone numbers are voice capable, but not SMS capable. This is shown in the Notify properties with relevant messages. Two methods are available to check this: `isSMSCapable` and `isVoiceCapable`.

---

**Configuring the Twilio service with endpoints in legacy Notify**

In order for the Twilio service to receive Notify commands, the Request URL field value for every Twilio telephone number must point to the ServiceNow instance that uses Notify with that Twilio telephone number.

**Note:** This content applies only to the Legacy Notify application, available prior to the Geneva release. For information about the Notify application available starting with Geneva, see [Notify](#).

To set these values, do one of the following:

- Define them manually in the Twilio service dashboard.
- Ensure the fields are blank in the Twilio service dashboard, then open the Notify Properties page. Notify automatically configures the correct endpoints if the Request URL fields are blank.

Set these values from within the Twilio service dashboard.
Figure 210: Twilio Numbers Dashboard

The notifyusa values underlined in the image should be replaced with your ServiceNow instance name, for:

- Voice Request URL: https://notifyusa.service-now.com/NotifyNowCallProcessor.do
- Status Callback URL: https://notifyusa.service-now.com/NotifyNowCallStatusProcessor.do
• Messaging Request URL: https://notifyusa.service-now.com/NotifyNowSmsProcessor.do

View and edit legacy Notify properties

You can view and edit Notify properties.

Role required: notifynow_admin

This content applies only to the Legacy Notify application, available prior to the Geneva release. For information about the Notify application available starting with Geneva, see Notify.

1. Navigate to Notify Administration Properties.

2. Fill in the fields.
Table 288: Notify Properties form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Account Status</td>
<td>Information showing the status of the associated Twilio account.</td>
</tr>
<tr>
<td>Twilio AccountSID</td>
<td>The Twilio account AccountSID, acting as the user name for that account.</td>
</tr>
<tr>
<td>Twilio AuthToken</td>
<td>The Twilio account AuthToken, acting as the password for that account. See Associating a Twilio Account.</td>
</tr>
<tr>
<td>Twilio SMS and voice enabled phone number</td>
<td>The Twilio number that Notify will use. Telephone numbers must be entered in the E.164 format and need to exist under the Twilio account. See Associating a Twilio Account.</td>
</tr>
<tr>
<td>Number of frequent conference call participants to be displayed</td>
<td>The number of people to display in the frequently called list.</td>
</tr>
<tr>
<td>Voice</td>
<td>The voice used for Notify communications. Select woman or man to provide female or male voice support for English, Spanish, French, German, and Italian. Select alice to provide female voice support for a wider range of languages.</td>
</tr>
</tbody>
</table>

3. Click Submit.

Legacy Notify account status messages

Account status messages are visible on the Notify Properties page.

Table 289: Account Status Message Descriptions

<table>
<thead>
<tr>
<th>Message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your account is ready for use</td>
<td>Notify is correctly configured and ready for use.</td>
</tr>
<tr>
<td>Your Twilio AccountSID or AuthToken are not valid</td>
<td>An incorrect value has been entered in the AccountSID or AuthToken fields in the Notify properties.</td>
</tr>
<tr>
<td>Your Twilio phone number is not valid</td>
<td>Incorrect telephone number information is defined in the Notify properties.</td>
</tr>
<tr>
<td>Your Twilio phone number does not have properly configured endpoints</td>
<td>The Request URL endpoint settings have not been properly configured.</td>
</tr>
<tr>
<td>Your Twilio account is not configured properly</td>
<td>One or more of your Twilio account settings is incorrect. Open the Twilio dashboard and check the settings.</td>
</tr>
</tbody>
</table>
Manage Legacy Notify conference call participants

As a Notify administrator, you can mute, unmute, and kick participants on a conference call.

Role required: notifynow_admin

This content applies only to the Legacy Notify application, available prior to the Geneva release. For information about the Notify application available starting with Geneva, see Notify.

Muting a participant prevents that person from speaking on the conference call but does not notify any participants, including the muted participant. Kicking a participant removes that person from the conference call and sets the Response field for the participant session to kicked.

1. Navigate to Notify Conference Calls.
2. Select an active conference call.
3. In the Notify Conference Call Participants related list, select a participant.
4. Click the button for the action you want to perform, such as Mute to mute the participant.

You can perform these actions for multiple participants as a single operation using the Actions on selected rows choice list on the Notify Conference Call Participants related list.

Installed with Legacy Notify

Activating the Notify plugin adds or modifies tables, user roles, script includes, and other components.

Note: This content applies only to the Legacy Notify application, available prior to the Geneva release. For information about the Notify application available starting with Geneva, see Notify.

Tables

Notify adds or modifies the following tables.

<table>
<thead>
<tr>
<th>Display Name [Table Name]</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Answer [notifynow_answer]</td>
<td>Information for possible answers to the SMS question sent.</td>
</tr>
<tr>
<td>Conversation [notifynow_conversation]</td>
<td>Information for the conversation thread.</td>
</tr>
<tr>
<td>NotifyNow Conference Call [notifynow_conference_call]</td>
<td>Information for conference call records.</td>
</tr>
<tr>
<td>NotifyNow Participant Session [notifynow_participant_session]</td>
<td>Information regarding conference call sessions for individual conference call participants.</td>
</tr>
<tr>
<td>Participant [notifynow_participant]</td>
<td>Information regarding individual conference call participants.</td>
</tr>
<tr>
<td>Question [notifynow_question]</td>
<td>Information for the possible questions in the SMS.</td>
</tr>
<tr>
<td>Response_action [notifynow_response_action]</td>
<td>Information for the notify response action associated with the question.</td>
</tr>
<tr>
<td>Display Name [Table Name]</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Response_choice [notifynow_response_choice]</td>
<td>Information for the notify response choice associated with the question.</td>
</tr>
<tr>
<td>SMS Messages [notifynow_message]</td>
<td>Information for the actual SMS messages sent.</td>
</tr>
</tbody>
</table>

## Properties

Notify adds the following system properties.

### Table 291: Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.notifynow.frequent_participant_count</td>
<td>The number of frequent conference call participants to be displayed.</td>
</tr>
<tr>
<td>glide.notifynow.voice</td>
<td>The voice used for Notify communications.</td>
</tr>
<tr>
<td>glide.notifynow.twilio.accountsid</td>
<td>The Twilio account AccountSID.</td>
</tr>
<tr>
<td>glide.notifynow.twilio.token</td>
<td>The Twilio account AuthToken.</td>
</tr>
<tr>
<td>glide.notifynow.twilio.phonenumber</td>
<td>The Twilio number that Notify will use.</td>
</tr>
<tr>
<td>glide.notifynow.twilio.answering_machine_detection</td>
<td>A boolean flag to enable or disable answering machine detection. Set to true to use answering machine detection. Set to false to continue the call.</td>
</tr>
<tr>
<td>nn.thread.release.age</td>
<td>The number of days after which the conversation thread release time runs out. Defaults to 10 days.</td>
</tr>
<tr>
<td>glide.notifynow.conference_call.code.pattern</td>
<td>The pattern used to generate a conference call code for public conference calls. Number signs (#) in the pattern are replaced with random numbers when a code is generated.</td>
</tr>
<tr>
<td>glide.notifynow.fix_invalid_phone_number</td>
<td>A boolean flag to enable or disable automatic correction of invalid phone numbers. Twilio might incorrectly prefix non-US phone numbers with 1. When this property is true, the instance automatically removes the 1 for non-US calls. When this property is false, you might be incorrectly identified when reconnecting to a call using SMS.</td>
</tr>
</tbody>
</table>

## User Roles

Notify adds the following user roles.
Table 292: User Roles

<table>
<thead>
<tr>
<th>Role</th>
<th>Contains Roles</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>notifynow_admin</td>
<td>None</td>
<td>Administrator with privileges for Notify functionality.</td>
</tr>
</tbody>
</table>

**UI Actions**

Notify adds the following UI actions.

Table 293: UI Actions

<table>
<thead>
<tr>
<th>UI Action</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiate Conference Call</td>
<td>Incident Communication Plan [incident_alert]</td>
<td>Adds a link to the Incident Communication Plan form, if that plugin is activated, which displays a dialog box for starting a conference call with selected participants.</td>
</tr>
<tr>
<td>Invite to Conference Call</td>
<td>NotifyNow Conference Call [notifynow_conference_call]</td>
<td>Adds a link to the Notify Conference Call form which displays a dialog box for adding more users to an active conference call.</td>
</tr>
</tbody>
</table>

**Script Includes**

Notify adds the following script includes.

Table 294: Script Includes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IncidentAlertConferenceCall</td>
<td>A utility JavaScript Prototype class allowing users to initiate the conference call and add other users to the conference call. Should be used in conjunction with the slushbucket UI page (notifynow_participant).</td>
</tr>
</tbody>
</table>

**Business Rules**

Notify adds the following business rules.
### Table 295: Business Rules

<table>
<thead>
<tr>
<th>Business Rule Name</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMS on new Incident Communication Plan</td>
<td>Incident Communication Plan</td>
<td>Sends an SMS to any default contacts added when an incident communication plan record is created.</td>
</tr>
<tr>
<td>Conference Call Allowed</td>
<td>Incident Communication Plan</td>
<td>Displays or hides the initiate conference call UI action by storing true or false in g_scratchpad.conferenceCallAllowed.</td>
</tr>
<tr>
<td>Update Conference Call Started IA Activity</td>
<td>NotifyNow Conference Call</td>
<td>Logs when a conference call started by writing to an incident communication plan's comment field if the source record is from the incident_alert table.</td>
</tr>
<tr>
<td>Update Conference Call Finished IA Activity</td>
<td>NotifyNow Conference Call</td>
<td>Logs when a conference call ended and what actions the conference call participants took by writing to an incident communication plan's comment field if the source record is from the incident_alert table.</td>
</tr>
</tbody>
</table>

### Workflow Activities

Notify adds the following workflow activities.

### Table 296: Workflow Activities

<table>
<thead>
<tr>
<th>Activity Name</th>
<th>Activity Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Send Notify SMS</td>
<td>Notify</td>
<td>Sends an SMS message (maximum 1600 Characters) to an E.164 compliant mobile phone number of the selected recipients and/or groups.</td>
</tr>
<tr>
<td>Activity Name</td>
<td>Activity Category</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Send Notify SMS Question</td>
<td>Notify</td>
<td>Sends predefined SMS Question message (maximum 1600 Characters) to an E.164 compliant mobile phone number of the selected recipients and/or groups. This is one of two main activities for workflow On-Call Assign by Acknowledgement. In a predefined message, the recipient is asked to assign himself to a newly created incident. The same message also contains predefined answers.</td>
</tr>
<tr>
<td>Send Email Question</td>
<td>Notify</td>
<td>Sends email generated from email template containing notification that recipient is the current On-call resource for a newly created task. This is one of two main activities for the workflow On-Call Assign by Acknowledgement. In a predefined message, the recipient is asked to assign himself to a newly created incident. The email contains two links that enable the user to accept or reject assignment.</td>
</tr>
</tbody>
</table>

Legacy Notify API

The legacy Notify API provides functionality for sending emails, sending SMS messages, and setting up conference calls.

Use this when you want to use Notify functionality with applications on your system.

**Note:** This API is included with the legacy Notify functionality. For APIs included in the current Notify feature, see the Notify, NotifyAction, NotifyPhoneNumber, and NotifyClient APIs.

**NotifyNow - getReadyState()**

Indicates whether Notify is set up correctly or not.

This method can only be accessed by administrators or users with the notifynow_admin role. Users with all other roles get the message False when trying to run the function in a script.

**Table 297: Parameters**

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 298: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boolean</td>
<td>True if Notify is set up correctly, otherwise false.</td>
</tr>
</tbody>
</table>

```javascript
var nn = new SNC.NotifyNow();
gs.log(((nn.getReadyState()) ? "OK" : "NOT OK"));
```

**NotifyNow - getStatus()**

Returns the current status of Notify configuration.

This method can only be accessed by administrators or users with the notifynow_admin role. Users with all other roles get the message Unauthorized when trying to run the function in a script.

Table 299: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 300: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>One of the possible status messages.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO_NUMBER_MESSAGE</td>
<td>The account does not have a telephone number set up. Ensure that you set up the telephone number for the account.</td>
</tr>
<tr>
<td>NO_ENDPOINTS_MESSAGE</td>
<td>The account does not have its endpoints set up correctly. Ensure that you set up the endpoints for the account.</td>
</tr>
<tr>
<td>ACCOUNT_OK_MESSAGE</td>
<td>The account is active and ready for use.</td>
</tr>
<tr>
<td>ACCOUNT_NO_AUTH</td>
<td>The Twilio AuthToken is not valid.</td>
</tr>
<tr>
<td>ACCOUNT_NOT_CONFIGURED</td>
<td>AccountSID or AuthToken is not valid.</td>
</tr>
</tbody>
</table>

```
var nn = new SNC.NotifyNow();
gs.log(nn.getStatus());
```

NotifyNow - initiateConferenceCall(String[] conferenceCallParticipants, String conferenceCallTitle)

Initiate a new conference call.

Table 301: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>conferenceCallParticipants</td>
<td>String</td>
<td>One or more users, conference call participants, identified by the sys_ids from the sys_user table or E.164-compliant phone numbers.</td>
</tr>
</tbody>
</table>
### Table 302: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GlideRecord</td>
<td>The conference call record, or null if there was an error.</td>
</tr>
</tbody>
</table>

This initiates a conference call with E.164-compliant phone numbers for participants, without the optional source record parameter and and does not send any conference call details via SMS or email.

```javascript
var participants = ['+31205655548', '+31205655552', '+31652825393'];
// set up conference call
var nn = new SNC.NotifyNow();
var conferenceCall = nn.initiateConferenceCall(participants, "testing12");
gs.log('started conference call: ' + conferenceCall.getUniqueValue());
```

### NotifyNow - initiateConferenceCall

**initiateConferenceCall(String[] conferenceCallParticipants, String conferenceCallTitle, GlideRecord sourceRecord, Boolean private)**

Initiate a new conference call.

### Table 303: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>conferenceCallParticipants</td>
<td>String</td>
<td>One or more users, conference call participants, identified by the sys_ids from the sys_user table or E.164-compliant phone numbers.</td>
</tr>
<tr>
<td>conferenceCallTitle</td>
<td>String</td>
<td>Title of the conference call. This parameter has a maximum length of 40 characters.</td>
</tr>
<tr>
<td>sourceRecord</td>
<td>GlideRecord</td>
<td>Source record to associate to the conference call such as an incident or problem number.</td>
</tr>
<tr>
<td>private</td>
<td>Boolean</td>
<td>Value to control if a conference call is private. This value defaults to false.</td>
</tr>
</tbody>
</table>
This initiates a conference call with participants that have a E.164-compliant phone number and participants from the sys_user table and sends conference call details via SMS and email to all participants.

```javascript
// define phone number participants
var participants = ['+31205655548', '+31205655552', '+31652825393'];

// we also want to add two Dutch sys_user participants
var user = new GlideRecord('sys_user');
user.addNotNullQuery('mobile_phone');
user.addQuery('mobile_phone', 'STARTSWITH', '+316');
user.setLimit(2);
user.query();

// add users to the participant array
while (user.hasNext() && user.next()) {
    gs.log('adding user ' + user.getValue('name') + ' with phone number ' + user.getValue('mobile_phone') + ' to the participant array');
    participants.push(user.getUniqueValue());
}

// define a source record to associate with the conference call
var source = new GlideRecord("cmdb_ci");
source.query("asset_tag", "P1000167");
if (source.hasNext() && source.next()) {
    // set up conference call
    var nn = new SNC.NotifyNow();
    var conferenceCall = nn.initiateConferenceCall(participants, "testing 1 2", source);

    // check if the conference call was successfully created
    if (conferenceCall != null) {
        gs.log('started conference call: ' + conferenceCall.getUniqueValue());
    } else {
        gs.log('could not start the conference call :(');
    }
}
```

**NotifyNow - isCallable(String participant)**

Determines whether a user is callable or not.

A user must have a valid phone number to be callable. A user who is already in an active session is not callable.
Table 305: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>participant</td>
<td>String or GlideRecord</td>
<td>A sys_user or notifynow_participant record, or an E.164-compliant phone number.</td>
</tr>
</tbody>
</table>

Table 306: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>boolean</td>
<td>Whether this participant can be called or not.</td>
</tr>
</tbody>
</table>

```javascript
var nn = new SNC.NotifyNow();
gs.log('by number: ' + nn.isCallable('+31612345678'));

var user = GlideRecord('sys_user');
user.query('sys_id', '13d39544eb5201003cf587b9d106fea9');
if (user.hasNext() && user.next())
gs.log('by user: ' + nn.isCallable(user));

var participant = GlideRecord('notifynow_participant');
participant.query('sys_id', '33b11430eb1201003cf587b9d106feb9');
if (participant.hasNext() && participant.next())
gs.log('by participant: ' + nn.isCallable(participant));
```

**NotifyNow - isSMSCapable()**

Checks if the telephone number associated with the Twilio account is capable of sending SMS messages.

Table 307: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 308: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boolean</td>
<td>Whether the telephone number associated with the Twilio account is capable of sending SMS messages.</td>
</tr>
</tbody>
</table>

```javascript
gs.log('The twilio number is SMS capable: ' + ((new SNC.NotifyNow().isSMSCapable()) ? 'yes' : 'no'));
```
NotifyNow - isSMSCapable(String userID)
Checks if a user is able to send SMS messages.

Table 309: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>userID</td>
<td>String</td>
<td>The sys_id of the user you want to check for an SMS-capable phone number.</td>
</tr>
</tbody>
</table>

Table 310: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boolean</td>
<td>If the user can send SMS messages.</td>
</tr>
</tbody>
</table>

```javascript
gs.log('the user is able to send SMS messages (e.g. has a SMS device): ' + ((new SNC.NotifyNow().isSMSCapable('<user sys_id>')) ? 'yes' : 'no'));
```

NotifyNow - isVoiceCapable()
Checks if the telephone number associated with the Twilio account is capable of setting up phone calls.

Table 311: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 312: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boolean</td>
<td>Whether the telephone number associated with the Twilio account is capable of setting up phone calls.</td>
</tr>
</tbody>
</table>

```javascript
gs.log('the Twilio number is Voice capable: ' + ((new SNC.NotifyNow().isVoiceCapable()) ? 'yes' : 'no'));
```

NotifyNow - isVoiceCapable(String userID)
Checks if a user is able to make voice calls.
Table 313: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>userID</td>
<td>String</td>
<td>The sys_id of the user you want to check for a voice-call capable phone number.</td>
</tr>
</tbody>
</table>

Table 314: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>boolean</td>
<td>Whether the user has a voice-call capable phone number.</td>
</tr>
</tbody>
</table>

```javascript
gs.log('the user is able to send SMS messages (e.g. has a SMS device): ' +
    ((new SNC.NotifyNow().isVoiceCapable('someuserid')) ? 'yes' : 'no'));
```

NotifyNow - kick(GlideRecord participant)

Removes a participant from a conference call.

Table 315: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>participant</td>
<td>GlideRecord</td>
<td>The conference call participant to remove from the call.</td>
</tr>
</tbody>
</table>

Table 316: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boolean</td>
<td>True if the participant was removed, otherwise false.</td>
</tr>
</tbody>
</table>

```javascript
var participantId = "<participant sys_id>";
var participant = new GlideRecord('notifynow_participant');
participant.get(participantId);
if (participant.isValid()) {
    // kick participant
    result = new SNC.NotifyNow().kick(participant);
    gs.log('participant kicked: ' + result);
}
NotifyNow - mute(GlideRecord participant)

Mutes a participant on a conference call.

Table 317: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>participant</td>
<td>GlideRecord</td>
<td>The conference call participant to mute.</td>
</tr>
</tbody>
</table>

Table 318: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boolean</td>
<td>True if the participant was muted, otherwise false.</td>
</tr>
</tbody>
</table>

```
var participantId = "<participant sys_id>";
var participant = new GlideRecord('notifynow_participant');
participant.get(participantId);
if (participant.isValid()) {
    // mute participant
    result = new SNC.NotifyNow().mute(participant);
    gs.log('participant muted: ' + result);
}
```

NotifyNow - umute(GlideRecord participant)

Unmutes a participant on a conference call.

Table 319: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>participant</td>
<td>GlideRecord</td>
<td>The muted conference call participant to unmute.</td>
</tr>
</tbody>
</table>

Table 320: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boolean</td>
<td>True if the participant was unmuted, otherwise false.</td>
</tr>
</tbody>
</table>

```
var participantId = "<participant sys_id>";
var participant = new GlideRecord('notifynow_participant');
participant.get(participantId);
if (participant.isValid()) {
    // unmute participant
```
result = new SNC.NotifyNow().unmute(participant);
gs.log('participant unmuted: ' + result);
}

NotifyNow - sendEmailQuestion(String emailAddress, String question, GlideRecord sourceRecord, String emailSubject)

Send an email question to an email address.

The sendEmailQuestion method produces a question body and requires users to click a link to indicate their choice.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>emailAddress</td>
<td>String</td>
<td>Email address to send the question to.</td>
</tr>
<tr>
<td>question</td>
<td>String or GlideRecord</td>
<td>The question record to send or the sys_id of a question record.</td>
</tr>
<tr>
<td>sourceRecord</td>
<td>GlideRecord</td>
<td>An optional source record to associate to the SMS question, such as an incident.</td>
</tr>
<tr>
<td>emailSubject</td>
<td>String</td>
<td>Optional text to override the default email subject.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>The conversation sys_id.</td>
</tr>
</tbody>
</table>

This example demonstrates using the default email subject.

```javascript
var user = GlideRecord("sys_user");
user.get("email", "someone@somedomain.com");

new SNC.NotifyNow().sendEmailQuestion(user.getValue('email'), "b6b34500bf3111003cf585ce2c0739ce", user);
```

This example uses dot-walking and specifies a source record and email subject.

```javascript
new SNC.NotifyNow().sendEmailQuestion("someone@somedomain.com", "b6071733bf1111003cf585ce2c07390f", current, "Please answer this question");
```

This example uses dot-walking and specifies an email subject but no source record.

```javascript
new SNC.NotifyNow().sendEmailQuestion("someone@somedomain.com", "b6071733bf1111003cf585ce2c07390f", user);
```
"Please answer this question");

NotifyNow - sendSMS(String phoneNumber, String smsBody)
Sends an SMS message to an E.164-compliant mobile phone number.
Notify supports international numbers. Using this method with a number that does not support sending SMS messages results in an error being logged.

Table 323: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>phoneNumber</td>
<td>String</td>
<td>The E.164-compliant phone number to send the message to.</td>
</tr>
<tr>
<td>smsBody</td>
<td>String</td>
<td>The message to send, maximum 1600 characters.</td>
</tr>
</tbody>
</table>

Table 324: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></td>
</tr>
</tbody>
</table>

```
new SNC.NotifyNow().sendSMS("+31612345678", "This is a message without source record");
```

NotifyNow - sendSMS(String phoneNumber, String smsBody, GlideRecord source)
Sends an SMS message to an E.164-compliant mobile phone number.
Notify supports international numbers. Using this method with a number that does not support sending SMS messages results in an error being logged.

Table 325: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>phoneNumber</td>
<td>String</td>
<td>The E.164-compliant phone number to send the message to.</td>
</tr>
<tr>
<td>smsBody</td>
<td>String</td>
<td>The message to send, maximum 1600 characters.</td>
</tr>
<tr>
<td>source</td>
<td>GlideRecord</td>
<td>The source record to associate with this SMS message.</td>
</tr>
</tbody>
</table>
var source = new GlideRecord("my_table");
source.query("my_field", "my_value");

if (source.hasNext() && source.next()) {
  // send a text message
  var nn = new SNC.NotifyNow();
  var message = "this is just a test";
  var number = "+31612345678";
  nn.sendSMS(number, message, source);
}

This example uses dot-walking and the current record as the source record.
new SNC.NotifyNow().sendSMS("+31612345678", "this is a test", current);

NotifyNow - sendSMSQuestion(String phoneNumber, String question, GlideRecord sourceRecord)
Sends an SMS question.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>phoneNumber</td>
<td>An E.164-compliant phone number to send the message to.</td>
<td></td>
</tr>
<tr>
<td>question</td>
<td>The question record to send or the sys_id of a question record.</td>
<td></td>
</tr>
<tr>
<td>sourceRecord</td>
<td>An optional source record to associate to the SMS question, such as an incident.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>The conversation sys_id, or null if the SMS was not sent successfully.</td>
</tr>
</tbody>
</table>

var question = new GlideRecord("notifynow_question");
question.query();

// get the first question
if (question.hasNext() && question.next()) {
    // send the sms question
    var number = "+31612345678";
    var nn = new SNC.NotifyNow();
    nn.sendSMSQuestion(number, question.getUniqueValue(), current);
}

NotifyNow - addConferenceCallParticipant(String conferenceCall, String participant)

Adds ad-hoc users to an ongoing conference call.

When the method is called with a phone number for the participant parameter and there is exactly one sys_user record that matches the phone number, that sys_user record will be related to the participant. The participant's phone number field will be left blank because the phone number is in the sys_user record. If there are several sys_user records that match the phone number, or if there are no results, the participant's phone number field will be filled in, and there will be no stored reference to sys_user because the user is not known.

Table 329: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>conferenceCall</td>
<td>String or GlideRecord</td>
<td>The sys_id or GlideRecord of an active conference call.</td>
</tr>
<tr>
<td>participant</td>
<td>String or GlideRecord</td>
<td>The sys_id or GlideRecord of a user with an E.164-compliant phone number, or an E.164-compliant phone number.</td>
</tr>
</tbody>
</table>

Table 330: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GlideRecord</td>
<td>The participant record of the new participant that was added to the conference call.</td>
</tr>
</tbody>
</table>

// add a new participant by conference call sys_id (string) and phone number (string)
var nn = new SNC.NotifyNow();
gs.log(nn.addConferenceCallParticipant('d193b242eb020100a04d4910f206fe39', '+31612345678'));

// add a new participant by conference call sys_id (string) and user record (GlideRecord)
var user = new GlideRecord('sys_user');
user.query('user_name', 'myUserName');
if (user.hasNext() && user.next()) {
var nn = new SNC.NotifyNow();

gs.log(nn.addConferenceCallParticipant('d193b242eb020100a04d4910f206fe39',
    user));

    // you could have added the user by sys_id as well:
    //
    nn.addConferenceCallParticipant('d193b242eb020100a04d4910f206fe39',
        user.getValue('sys_id'));
} else {
    gs.log('no such user');
}

// add a new participant by conference call record (GlideRecord)
and phone number (string)
var conferenceCall = new GlideRecord('notifynow_conference_call');
conferenceCall.query('title', 'IA0001001');
if (conferenceCall.hasNext() && conferenceCall.next()) {
    var nn = new SNC.NotifyNow();
    gs.log(nn.addConferenceCallParticipant(conferenceCall,
        '+31612345678'));
} else {
    gs.log('no such conference call');
}

### NotifyNow - convertLocalPhoneNumberToE164(String userID, String phoneNumber)

Converts a local phone number to an E.164-compliant phone number based on a user's location.

**Table 331: Parameters**

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>userID</td>
<td>String</td>
<td>The sys_id of a sys_user record to get location information from.</td>
</tr>
<tr>
<td>phoneNumber</td>
<td>String</td>
<td>The phone number.</td>
</tr>
</tbody>
</table>

**Table 332: Returns**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>The E.164-compliant phone number.</td>
</tr>
</tbody>
</table>

var localPhoneNumber = '01784 221600';
var userName = 'Heath Vanalphen';

var user = new GlideRecord('sys_user');
user.get('name',userName);
var E164Number = new
SNC.NotifyNow().convertLocalPhoneNumberToE164(user.getUniqueValue(),
localPhoneNumber);
gs.log('converted: ' + phoneNumber + ' to ' + E164Number + ' based on ' + user.getValue('name') + '\''s location (' + user.getValue('location') + ')');

NotifyNow - getConferenceCallParticipants(String conferenceCallId, Boolean isCallable)

Returns all participants for a conference call.

Table 333: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>conferenceCallId</td>
<td>String</td>
<td>The ID of the conference call.</td>
</tr>
<tr>
<td>isCallable</td>
<td>Boolean</td>
<td>An optional flag to return either only the users you can call (true) or those you cannot call (false).</td>
</tr>
</tbody>
</table>

Table 334: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GlideRecord</td>
<td>The participants</td>
</tr>
</tbody>
</table>

```javascript
var nn = new SNC.NotifyNow();
var user = nn.getConferenceCallParticipants('c2e91710eb120100f34087b9d106fe37');
while (user.hasNext() && user.next()) {
  if (user.getValue('participant')) {
    gs.log('user: ' + user.getValue('sys_id'));
  } else {
    gs.log('phone number: ' + user.getValue('phone_number'));
  }
}
```

```javascript
var nn = new SNC.NotifyNow();
var user = nn.getConferenceCallParticipants('c2e91710eb120100f34087b9d106fe37', true);
while (user.hasNext() && user.next()) {
  if (user.getValue('participant')) {
    gs.log('user: ' + user.getValue('sys_id'));
  } else {
    gs.log('phone number: ' + user.getValue('phone_number'));
  }
}
```
```javascript
var conferenceCallId = '32b11430eb1201003cf587b9d106feb8';

// get all participants
gs.log('all conference call participants:');
var nn = new SNC.NotifyNow();
var user = nn.getConferenceCallParticipants(conferenceCallId);
gs.log(user);

// get all callable participants
gs.log('all conference call participants we can call:');
user = nn.getConferenceCallParticipants(conferenceCallId, true);
gs.log(user);

// get all un callable participants
gs.log('all conference call participants that are already in an active session and whom we cannot call:');
user = nn.getConferenceCallParticipants(conferenceCallId, false);
gs.log(user);
```

**NotifyNow - getFrequentlyCalledUsers(Number limit)**

Returns a number of frequently-called users, up to the limit parameter, in alphabetical order.

**Table 335: Parameters**

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>limit</td>
<td>Number</td>
<td>The maximum number of results.</td>
</tr>
</tbody>
</table>

**Table 336: Returns**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GlideRecord</td>
<td>The frequently called users in alphabetical order.</td>
</tr>
</tbody>
</table>

```javascript
var nn = new SNC.NotifyNow();
var fc = nn.getFrequentlyCalledUsers(10);

while (fc.hasNext() && fc.next()) {
    gs.log("got user " + fc.getValue('name') + ' - ' + fc.getValue('sys_id'));
}
```

**NotifyNow - getPreferredE164VoiceNumber(GlideRecord user)**

Returns a user's preferred E.164-compliant phone number for voice calls.
Table 337: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>user</td>
<td>GlideRecord or String</td>
<td>The user record or the sys_id of a user to get the E.164-compliant phone number from.</td>
</tr>
</tbody>
</table>

Table 338: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>The E.164-compliant phone number or null.</td>
</tr>
</tbody>
</table>

```javascript
var userID = "<user sys_id>";
var E164Number = new SNC.NotifyNow().getPreferredE164VoiceNumber(userID);
gs.log('the preferred phone number for setting up voice calls is ' + E164Number + ' for user with id: ' + userID);
```

**NotifyNow - getPreferredE164SMSNumber(GlideRecord user)**

Returns a user's preferred E.164-compliant phone number for SMS messages.

Table 339: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>user</td>
<td>GlideRecord or String</td>
<td>The user record or the sys_id of a user to get the E.164-compliant phone number from.</td>
</tr>
</tbody>
</table>

Table 340: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>The E.164-compliant phone number or null.</td>
</tr>
</tbody>
</table>

```javascript
var userID = "<user sys_id>";
var E164Number = new SNC.NotifyNow().getPreferredE164SMSNumber(userID);
gs.log('the preferred phone number for sending SMS notifications is ' + E164Number + ' for user with id: ' + userID);
```

**NotifyNow - getPreferredEmailAddress(GlideRecord user)**

Returns a user's preferred email address
Table 341: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>user</td>
<td>GlideRecord or String</td>
<td>The user record or the sys_id of a user to get the email address from.</td>
</tr>
</tbody>
</table>

Table 342: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>The email address or null.</td>
</tr>
</tbody>
</table>

```javascript
var userID = "some user sys id";
var email = new SNC.NotifyNow().getPreferredEmailAddress(userID);
gs.log('the preferred email address for sending email notifications is ' + email + ' for user with id: ' + userID);
```

Legacy: Chat

Chat is deprecated in the Istanbul release.

**Note:** The Connect on page 460 feature provides an updated instant messaging platform, which is activated by default for new instances. The legacy chat and Connect features should not be used concurrently. There is no migration path from legacy chat to Connect.

Chat provides real-time communication via instant messaging between users in a ServiceNow instance. Features include:

- One-to-one chats (instant messaging) between users.
- Chat rooms for conversations with multiple users. Chat rooms may be public (any user can join) or private (only invited users can join).
- Chat rooms linked to task records. Users can work together to solve issues, and conversation history can be shared by everyone who needs to reference it.
- Help desk chat. End users can access live support via instant messaging. Service desk staff can resolve basic issues in real-time or create incidents directly from chat requests for more extensive issues.
Legacy: Get started with Chat

Get started with legacy chat.

Role required: admin

1. Establish use guidelines. Social media can improve communication and aid productivity. To get the most out of these tools, establish clear and simple social media guidelines that foster information sharing and a comfortable work environment.

2. Activate the Chat plugin to enable the legacy chat and legacy Help Desk Chat features.

3. Configure security settings. Users must log in to use the legacy chat features in the base system. The standard system security settings and Social IT-specific security settings are available. To learn more about setting up these features, refer to the plugin activation pages.

   - Chat rooms may be Public (any user can join) or Private (only invited users can join).
Administrators can limit who can read chat messages on tasks and who can create chat rooms.

Legacy: Installed with Chat

What components are installed with legacy chat.

Demo data is available for legacy chat. The demo data creates a chat queue called Help Desk Chat that is supported by the assignment group Chat Support. Additionally, the Help Desk Chat link is added to the header of the Employee Self-Service portal. To learn more, see Set Up Chat Queues for Help Desk Chat.

Other:

- Event: A new event called chat.invite is registered to trigger an email notification when users are invited into a chat room.
- Email Notification: An email notification called Chat Room Invite is added to send when users are invited to a chat room.

Legacy: Fields installed with legacy chat

Legacy chat adds fields.

<table>
<thead>
<tr>
<th>Display name [Table name]</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Header [content_block_header]</td>
<td>Adds the Help Desk Chat link to the ESS portal page.</td>
</tr>
</tbody>
</table>

Legacy: Properties installed with legacy chat

Legacy chat adds properties.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.chat.invite_fields</td>
<td>Comma-separated list of fields used to generate the invites when creating a chat room from a task. The user is presented with check boxes for each of the specified fields to select the invites for the chat room. The fields should be references or glide_lists of sys_user or sys_user_group.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: assignment_group.watch_list</td>
</tr>
<tr>
<td></td>
<td>• Location: Social IT Chat Administration Properties</td>
</tr>
<tr>
<td>glide.chat.show_emoticons</td>
<td>Setting that determines whether to display emoticons in conversations.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td></td>
<td>• Location: Social IT Chat Administration Properties</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| glide.chat.sound.message_received.mp3    | Sound played when a message is received in chat (mp3).  
|                                           | • Type: string  
|                                           | • Default value: media/rcvmsg.mp3  
|                                           | • Location: Social IT Chat Administration Properties                                                                                                                                                       |
| glide.chat.sound.message_received.ogg     | Sound played when a message is received in chat (ogg).  
|                                           | • Type: string  
|                                           | • Default value: media/rcvmsg.ogg  
|                                           | • Location: Social IT Chat Administration Properties                                                                                                                                                       |
| glide.chat.sound.queue_beep.mp3          | Sound played when a new user enters the chat queue (mp3). Both this property and glide.chat.sound.queue_beep.ogg must be defined for either property to work.  
|                                           | • Type: string  
|                                           | • Default value: media/button_toggle_on.mp3  
|                                           | • Location: Social IT Chat Administration Properties                                                                                                                                                       |
| glide.chat.sound.queue_beep.ogg           | Sound played when a new user enters the chat queue (ogg).  
|                                           | • Type: string  
|                                           | • Default value: media/button_toggle_on.ogg  
|                                           | • Location: Social IT Chat Administration Properties                                                                                                                                                       |
| glide.chat_room.create_roles              | Comma-separated list of roles that are allowed to create chat rooms.  
|                                           | • Type: string  
|                                           | • Default value: itil  
<p>|                                           | • Location: Social IT Chat Administration Properties                                                                                                                                                       |</p>
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.short_poll_delay</td>
<td>Short polling delay for XMPP requests. Enter a value in milliseconds. The minimum value is 250. With short polling, the browser sends a request to the server in fixed intervals defined by the property. To minimize performance impact, it is recommended that this value is set greater than or equal to the default value.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 1000 (one second)</td>
</tr>
<tr>
<td></td>
<td>• Location: Social IT Chat Administration Properties</td>
</tr>
</tbody>
</table>

Legacy: Script includes installed with legacy chat

Legacy chat adds script includes.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChatUtils</td>
<td>Provides utilities for chat conversations.</td>
</tr>
</tbody>
</table>

Legacy: Tables installed with legacy chat

Legacy chat adds tables.

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chat Actions [chat_actions]</td>
<td>Defines additional chat window menu items. Access at Social IT Chat Administration Actions (administrator and chat_admin).</td>
</tr>
<tr>
<td>Chat Channel [chat_channel]</td>
<td>Stores chat channels, which are chats between members. This table is extended by Chat thread [chat_thread] (a one-to-one chat) and chat_room (a multi-user chat). Extending or modifying data in this table is not recommended.</td>
</tr>
<tr>
<td>Chat Channel Member [chat_channel_member]</td>
<td>Relationship table that associates channels and members. Extending or modifying data in this table is not recommended.</td>
</tr>
<tr>
<td>Chat Message [chat_message]</td>
<td>Stores instant messages sent from any chat window. Extending or modifying data in this table is not recommended.</td>
</tr>
<tr>
<td>Chat Presence [chat_presence]</td>
<td>Stores presence (status) information for a user. Extending or modifying data in this table is not recommended.</td>
</tr>
<tr>
<td>Chat Queue [chat_queue]</td>
<td>Stores the groups and schedules for providing support via instant message. Defined at Social IT Chat Administration Queues (administrator and chat_admin).</td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Chat Queue Entry</td>
<td>Stores user requests for live support. Extends Task [task]. On a chat queue record, the Chat queue entries related list displays the entries that are associated with that chat queue. Extending or modifying data in this table is not recommended.</td>
</tr>
<tr>
<td>Chat Room</td>
<td>Stores chat rooms (multi-user chat). Extends Chat channel [chat_channel]. Can be modified if necessary (such as to change a chat room from public to private), but should almost always be managed by system functionality.</td>
</tr>
<tr>
<td>Chat Roster</td>
<td>Maintains users that are associated with a user’s My Friends list. Extending or modifying data in this table is not recommended.</td>
</tr>
<tr>
<td>Chat Roster Member</td>
<td>Tracks users that are members of a chat room. Extending or modifying data in this table is not recommended.</td>
</tr>
<tr>
<td>Chat Thread</td>
<td>Stores one-to-one chats. Extends Chat channel [chat_channel]. Extending or modifying data in this table is not recommended.</td>
</tr>
<tr>
<td>Live Headline</td>
<td>Sends system messages. For example, the system may send a message when a user enters or leaves a chat room. Extending or modifying data in this table is not recommended.</td>
</tr>
<tr>
<td>Live Poll Message</td>
<td>System table that stores and manages chat messages. Extending or modifying data in this table is not recommended.</td>
</tr>
<tr>
<td>Live User</td>
<td>System table that stores and maintains chat users. Extending or modifying data in this table is not recommended.</td>
</tr>
<tr>
<td>Stores the last live sequence number</td>
<td>Stores the last sequence ID. Extending or modifying data in this table is not recommended.</td>
</tr>
</tbody>
</table>

Legacy: Business rules installed with legacy chat

Legacy chat adds business rules.

<table>
<thead>
<tr>
<th>Name</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chat Queue [Task.active] Updater</td>
<td>Chat Queue Entry</td>
<td>Sets the chat queue entry Action field to Waiting when the action changes.</td>
</tr>
<tr>
<td></td>
<td>[chat_queue_entry]</td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>SNC - Chat Queue Average Wait Time</td>
<td>Chat Queue Entry [chat_queue_entry]</td>
<td>When a chat queue entry is accepted, calculates the average wait time for the queue by averaging the last 20 chat queue entries.</td>
</tr>
</tbody>
</table>

**Legacy: Chat use**

Legacy chat allows you to interact and collaborate through real-time instant messages with other users in an instance.

Use legacy chat to:

- Initiate or participate in chat conversations with one or multiple users.
- Initiate or participate in chat conversations that are attached to task records (such as an incident).
- See when other users are available to chat.

To open the chat desktop, navigate to Social IT Chat.

*Note:* Service desk staff may also provide live support to other users via help desk chat.
Legacy: Update your profile

Your profile identifies your contributions to legacy chat conversations.

Your profile identifies your contributions to conversations. It is created automatically the first time you use chat and consists of:

Table 343: Profile

<table>
<thead>
<tr>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>From your user account in ServiceNow. Your name appears on your messages and in the member list of any chat room you join.</td>
</tr>
</tbody>
</table>
To update your profile picture:

1. Click your picture in the top of the favorites list.
2. Browse to the desired picture file and click Open.

Note: Changes to your profile picture affect legacy chat and live feed if the Live Feed plugin is activated.

Figure 214: Chat profile picture

Legacy: Update your status

In legacy chat, your status lets other users know whether you are available to chat.

Your status lets other users know whether you are available to chat. Your current status is indicated by the color of the icon in the upper right of your favorites list, beside your name. View the status of other users in your favorites list.

To change your status:

1. Click the status icon beside your name.
2. Select a status (see table).
Table 344: Change status

<table>
<thead>
<tr>
<th>Status</th>
<th>Description</th>
<th>Appears to others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online</td>
<td>Indicates that you are available to chat.</td>
<td>Green icon:</td>
</tr>
<tr>
<td></td>
<td></td>
<td><img src="image" alt="Beth Anglin" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Figure 216: Chat available</td>
</tr>
<tr>
<td>Away</td>
<td>Indicates that you are not available because you are away.</td>
<td>Red icon:</td>
</tr>
<tr>
<td></td>
<td></td>
<td><img src="image" alt="Beth Anglin" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Figure 217: Chat away</td>
</tr>
<tr>
<td>Away with a message</td>
<td>Indicates that you are not available and gives a reason:</td>
<td>Red icon and message:</td>
</tr>
<tr>
<td></td>
<td>• In a meeting</td>
<td><img src="image" alt="Beth Anglin" /></td>
</tr>
<tr>
<td></td>
<td>• On the phone</td>
<td>Figure 218: Chat away msg</td>
</tr>
<tr>
<td></td>
<td>• Out to lunch</td>
<td></td>
</tr>
<tr>
<td></td>
<td>You cannot create a custom message from the chat desktop.</td>
<td></td>
</tr>
</tbody>
</table>

Figure 215: Change status
<table>
<thead>
<tr>
<th>Status</th>
<th>Description</th>
<th>Appears to others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Invisible</td>
<td>Indicates that you are not available. You can send and receive messages when your status is Invisible. You appear as Offline to other users.</td>
<td>Black icon: <img src="image1" alt="Beth Anglin" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Figure 219: Chat offline</td>
</tr>
<tr>
<td>Offline</td>
<td>Indicates that you are not available. You cannot send or receive messages when your status is Offline. Users that are not logged in appear as Offline.</td>
<td>Black icon: <img src="image2" alt="Beth Anglin" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Figure 220: Chat offline</td>
</tr>
</tbody>
</table>

**Legacy: Use your favorites list**

In legacy chat, your favorites list appears on your chat desktop and provides certain functions.
Table 345: Favorites list

- Users:
  - *Add another user* in the system to your favorites list.
  - See if your favorite users are available to chat. Users are organized alphabetically and in sections by status.
  - Start a conversation by double-clicking a name.
  - Expand or collapse a section by clicking Online or Offline.

- Rooms:
  - See the list of *your favorite chat rooms*.
  - Join a chat room by double-clicking its name.

- Favorites list toolbar:
  - Options (  
    ![Figure 222: Chat window menu](image)
    ): access a menu with options to *add a favorite user*, *view online users*, *create a chat room*, and *view chat rooms*.
  - Add User (  
    ![Figure 223: Add friend](image)
    ): *add a favorite user*.
  - Create Room (  
    ![Figure 224: Add room](image)
    ): *create a chat room*.
  - Invitations (  
    ![Figure 225: Chat invitation](image)
    ): respond to invitations to *join chat rooms*.
To expand or collapse a section in the favorites list, click the section header or click the arrows on the section header.

Legacy: Add a favorite user

How to add a user to your favorite users list in legacy chat.

1. Click the Add User button.

   ![Add friend](image)

   Figure 226: Add friend

2. Begin typing a user name and select a user from the list, or click the reference lookup and select a user from the table.

   ![Search icon](image)

   Figure 227: Search icon

3. Click OK.

Legacy: Remove a favorite user

How to remove a favorite user in legacy chat.

To remove a user from your favorite users list, right-click the user's name and select Remove From List.

Legacy: View an online user

How to view a list of all users who are available to chat (status of Online) in legacy chat.

1. Right-click the Users section header or click Options on the toolbar.

   ![Chat window menu](image)

   Figure 228: Chat window menu

2. Select Show Online Users.
   - Start a one-to-one chat with a user on the list by double-clicking a name.
   - Send Message or Add To Friend List by right-clicking a name.
Legacy: View a room

How to view a list of all public chat rooms in legacy chat.

1. Right-click the Rooms section header or click Options on the toolbar.

   ![Chat window menu]

   Figure 230: Chat window menu

2. Select Public Rooms.
   - To join a room, double-click a name or right-click and select Join Room. See Joining Chat Rooms.
Legacy: Start a one-to-one chat

How to start a one-to-one chat in legacy chat.

- To start a chat with one user in your favorites list, double-click the user's name or right-click and select Send Message.
- To start a chat with one available user, double-click the user's name on the online users list. See Viewing Online Users.

Send a message to start a conversation.

Legacy: Create a chat room

How to start a chat with multiple users from the legacy chat desktop.

To start a chat with multiple users from the chat desktop (requires access rights):

1. Click Create Room on the favorites list toolbar.

   ![Figure 232: Add room](image)

2. Enter the room details (see table).
3. Click Create Room. An invitation appears in the favorites list of all invited users and a new chat window opens on your chat desktop.
Figure 233: Chat task create
### Table 346: Chat task create

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room name</td>
<td>Enter a name to appear on the chat window header or click the Generate a unique room name button (Figure 234: Room name generator) to use a system-generated name. The default name for a room created from a task is Chat Room for &lt;Task Number&gt;.</td>
</tr>
<tr>
<td>Description</td>
<td>Enter a room description that appears under the name in the rooms list. The default description for a room created from a task is &lt;Short Description&gt;.</td>
</tr>
<tr>
<td>Password</td>
<td>Enter a password, if desired. If a password is specified, only users with the password can join the chat room.</td>
</tr>
<tr>
<td>Room avatar</td>
<td>Upload an image that appears beside the room name in the list of rooms. Click the picture and browse to the desired image file.</td>
</tr>
<tr>
<td>Features</td>
<td>Select all applicable check boxes:</td>
</tr>
<tr>
<td></td>
<td>• Public if all users can see the room in the rooms lists.</td>
</tr>
<tr>
<td></td>
<td>• Members Only if only invited users can join the room.</td>
</tr>
<tr>
<td></td>
<td>• Temporary if the room is not saved once all participants have left. This feature is not available for rooms created from tasks; task chat rooms are always available on the task record.</td>
</tr>
<tr>
<td>Invite</td>
<td>Add invited users by using the glide list. For a room created from a task, you can also select all applicable check boxes:</td>
</tr>
<tr>
<td></td>
<td>• Assignment group: invite all users in the assignment group for the task.</td>
</tr>
<tr>
<td></td>
<td>• Watch list: invite all users on the watch list for the task.</td>
</tr>
</tbody>
</table>
Note: This procedure is not possible if the Connect on page 460 feature is enabled.

1. Open the record (example, an incident on which you are working).

2. Click the Create or Join Chat Room related link.

3. If a chat room already exists, click a name to join the existing chat room. If no chat room exists, continue to the next step to create a new room.

4. Click the create link at the bottom of the window.

5. Enter the room details as you would for a chat room.

6. Click Create Room. An email notification is sent and appears in the favorites list for all invited users (the assignment group and the watch list, if selected, and additional invited users).
7. In the New Room Created message, click Join Room.
   • A new chat window opens on your chat desktop.
   • All invited users are listed in the chat member list. Invited users that are not currently participating in the chat are listed in gray.

Legacy: Join one-to-one chats

In legacy chat, when another user starts a chat by sending a message to you, a chat window opens on your chat desktop. To join the chat, click the window.

Legacy: Join a chat room

How to join a chat room in legacy chat.

1. If another user invites you to join a chat room, an invitation appears in your favorites list.

   ![Chat invitation](image)

   **Figure 237: Chat invitation**

2. To respond, click the invitation.

   A window opens that displays the room name, room description, and the name of the user who invited you.
   • To join the chat, click Join. When the chat window opens on your chat desktop, click the window.
   • To ignore the invitation, click Decline.

   ![View invitations](image)

   **Figure 238: View invitations**

To rejoin a favorite chat room that you have left, click the chat room name in the Rooms section of the favorites list.

To join a public chat room without an invitation, right-click the Rooms section header and select Public Rooms. Double-click a room name on the list.
Legacy: Join a chat room for a task

In legacy chat, if another user invites you to join a chat room from a task record, you receive an email notification.

1. Click the link in the email notification.
2. If a prompt for a password appears, enter the password listed in the email notification.
3. When the chat window opens on your chat desktop, click the window.

Legacy: Join a chat room from a task record without an invitation

How to join a chat room in legacy chat without an invitation.

**Note:** This procedure is not possible if the Connect on page 460 feature is enabled.

1. Open the task record.
2. Click the Create or Join Chat Room related link.
3. Click a chat room name.
4. If a prompt for a password appears, contact the person who created the chat room for the password.
   
   If a chat room has a password, only users with the password can join the chat.
5. When the chat window opens on your chat desktop, click the window.

Legacy: Chat windows

In legacy chat, a chat window appears on your chat desktop for each chat conversation that you start or join.
Figure 239: Chat window

Legacy: Send messages in legacy chat

How to send messages in legacy chat.

To chat with other users that have joined the conversation, enter your message in the text field at the bottom of the window and press Enter. The message appears in the other users’ chat windows.

To send a link, type the full URL (example, http://www.service-now.com). When the message is sent, the text appears blue and any user in the conversation can click it to follow the link.

To send a smiley face, type a colon followed by a close parentheses (:)). When the message is sent, a smiley face 🤗 appears in place of the text. For more emoticons, see Sending Emoticons in Messages (Smileys).

Chat activity is indicated with the following alerts:

- When a new message is posted to an inactive browser tab, the tab name blinks.
- When a new message is posted to an inactive chat window, the window header appears in yellow and blinks.
• When a user joins or leaves a room, a message appears in the other room members’ chat windows.

Legacy: Send emoticons in legacy chat messages (smileys)

How to send emoticons (smileys) in legacy chat.

To send an emoticon (smiley), type text from the following table. When your message is sent, the emoticon appears in place of the text. For example, enter colon followed by a close parentheses (:) and a smiley face 😊 appears in your message.

<table>
<thead>
<tr>
<th>Text</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>:D :-D</td>
<td>😊</td>
</tr>
<tr>
<td>B-) BD B-D</td>
<td>😎</td>
</tr>
<tr>
<td>:* :*:</td>
<td>😞</td>
</tr>
<tr>
<td>:( :-:(</td>
<td>😞</td>
</tr>
</tbody>
</table>

Table 347: Emoticons

© 2018 ServiceNow. All rights reserved.
<table>
<thead>
<tr>
<th>Text</th>
<th>Image</th>
<th>Figure Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;3</td>
<td><img src="image" alt="Heart" /></td>
<td>Figure 245: Heart</td>
</tr>
<tr>
<td>;) :-)</td>
<td><img src="image" alt="Wink" /></td>
<td>Figure 246: Wink</td>
</tr>
<tr>
<td>:P :-P</td>
<td><img src="image" alt="Playful" /></td>
<td>Figure 247: Playful</td>
</tr>
<tr>
<td>:O :-O</td>
<td><img src="image" alt="Surprise" /></td>
<td>Figure 248: Surprise</td>
</tr>
<tr>
<td>X( X-(</td>
<td><img src="image" alt="Angry" /></td>
<td>Figure 249: Angry</td>
</tr>
<tr>
<td>;( ) ;(</td>
<td><img src="image" alt="Blush" /></td>
<td>Figure 250: Blush</td>
</tr>
<tr>
<td>:(( :((</td>
<td><img src="image" alt="Crying" /></td>
<td>Figure 251: Crying</td>
</tr>
<tr>
<td>(A)</td>
<td><img src="image" alt="Halo" /></td>
<td>Figure 252: Halo</td>
</tr>
<tr>
<td>;? :-?</td>
<td><img src="image" alt="Undecided" /></td>
<td>Figure 253: Undecided</td>
</tr>
</tbody>
</table>
Legacy: Change the display

How to change the display of legacy chat.

To view the chat window menu, click the gear button (  

Figure 254: Chat window menu

) in the bottom left.

- To show or hide timestamps, select Show Timestamps from the chat window menu or press F2.
- To show or hide the chat member list, select Show Members from the chat window menu or press F4.

To resize the window, point to the lower corner (left or right). When the pointer changes shape, drag the window to the desired size.

To move the window, point to the header. When the pointer changes shape, drag the window anywhere on your chat desktop.

To close a chat window, click the X in the upper right corner.

Legacy: Invite a user into a chat

How to invite another user into a chat in legacy chat.

1. Select Invite User from the chat window menu.

Figure 255: Chat window menu

2. Begin typing a user name and select a user from the list, or click the reference lookup and select a user from the table.

Figure 256: Search icon

3. Click OK.

An invitation is sent to the selected user. One-to-one chats are automatically converted into temporary chat rooms.

Legacy: Add a favorite room

How to add a favorite room in legacy chat.

To add a room to your favorites, click the chat window and select Add To Favorites from the chat window menu.

Figure 257: Chat window menu

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Legacy: Remove a favorite room

How to remove a favorite room in legacy chat.

To remove a room from your favorites, right-click the room name and select Remove From List.

Legacy: Set your chat preferences

Use the Chat Window Preferences to set audio notifications and default chat window display options in legacy chat.

Use the Chat Window Preferences to set audio notifications and default chat window display options. The default display options control how a chat window looks when you first open it. You can still control the display options for an individual window as described inChanging the Display.

To view your chat preferences, click your name in the upper left corner of the chat desktop and select Chat Preferences.

![Chat Window Preferences]

Figure 258: Chat preferences

To set your preferences, select or clear the check boxes next to the options, then click Update.

<table>
<thead>
<tr>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio</td>
<td>Turn audio notifications on or off.</td>
</tr>
<tr>
<td>Conversation Windows</td>
<td>Set default options for showing timestamps and members in one-to-one chats.</td>
</tr>
<tr>
<td>Group Chat Windows</td>
<td>Set default options for showing timestamps members in chat rooms.</td>
</tr>
</tbody>
</table>
Legacy: Delete a chat room

You can delete chat rooms in legacy chat.

Role required: chat_admin

Note that when you delete a chat room, the system also deletes the records for any chat members and messages.

1. In the application navigator filter, enter chat_room.list.
2. Delete multiple chat rooms from the list or open a chat room record and click Delete.

Legacy chat administration

Users with the chat_admin role can administer various aspects of legacy chat.

Define chat room access rights

Control the access rights for creating a chat room so that not all users can create a chat room.

Role required: chat_admin

To define the access rights for creating chat rooms:

1. Navigate to Social IT Chat Administration Properties.
2. Locate the property Comma-separated list of roles that are allowed to create chat rooms.
3. Enter user roles. A user must have one of the specified roles to create a chat room.

Change chat room message read access

In legacy chat, you can associate a chat room with a record, such as an incident, and add the chat messages to a Chat Activity journal field on the form.

Role required: admin

By default, a user can read the chat messages for a room if either of the following is true:

• The room is public
• The user is a member of the room

To change chat room message read access:

- Modify the Chat message access control rule or create a new rule.
- Read access to the messages displayed is handled by the access control list security operation chat_messages_read on the Chat room [chat_room] table.

View a legacy chat message as a journal field

You can view all chat messages in one place by viewing them as a journal field.

Chat rooms can be linked to any task record in the following ways:

• Create a room from the record.
• Create a record from a chat room, such as creating an incident from a Help Desk Chat.
To view the chat messages as a journal field:

Configure the task record form to select the Chat Activity field.

The maximum number of chat messages that are displayed by this field is 1000.

![Chat Activity](image)

**Figure 259: Chat Activity**

**Chat actions**

Chat actions are additional items that appear in the chat window menu (requires the Chat plugin). Administrators and users with the chat_admin role can define chat actions.
Add actions to the legacy chat window menu

You can create new actions and add them to the chat window menu.

1. Navigate to Social IT > Chat Administration > Actions.
2. Select an action to edit or click New.
3. Enter the chat action details and click Update or Submit.

The following example demonstrates how to add a chat action that appears only on windows where the user is a Help Desk Agent. The action appears on the menu as Show User Type and opens a popup window that indicates a current user of queue_agent.

- Action Name: Show User Type
- Active: Select the check box.
- Order: 100
- Client Show Condition:
  \[answer = g\_chat.getChatType() == 'queue\_agent';\]
- OnClick Action Script:
  \[alert('The current user is: ' + g\_chat.getChatType());\]
Chat Actions

- **Action name:** Show User Type
- **Active:** Yes
- **Order:** 100

```javascript
answer = g_chat.getChatType() == 'queue_agent';
alert('The current user is: ' + g_chat.getChatType());
```

Help Desk Chat - System Administrator

Thank you for contacting support. Your

The page at http://localhost:8080 says:
The current user is: queue_agent

- **Invite Another User**
- Show Timestamps
- Show Members
- Create Incident from Chat
- Show User Type
Chat action details

You can define a chat action name and the script that runs when the action is selected.

### Chat action details

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action Name</td>
<td>Enter a label for the action as it appears in the menu.</td>
</tr>
<tr>
<td>Active</td>
<td>Select the check box to activate or clear the check box to deactivate the action. Only active actions may appear in the menu.</td>
</tr>
<tr>
<td>Order</td>
<td>Enter the order in which the action appears in the menu. Standard menu items (such as Show Timestamps) always appear at the top of the chat menu, followed by chat actions in order.</td>
</tr>
<tr>
<td>Client Show Condition</td>
<td>Define the conditions under which this menu option appears. The show condition must set the predefined answer variable to a boolean value.</td>
</tr>
<tr>
<td>OnClick Action Script</td>
<td>Enter the JavaScript code that runs when the menu item is selected.</td>
</tr>
</tbody>
</table>

### Available methods associated with the g_chat variable

The g_chat variable is a legacy chat window object that is available in the Client Show Condition and OnClick Action Script of a chat action definition.

The following table defines the available methods associated with this object.

### Method Summary

<table>
<thead>
<tr>
<th>Return Object</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Array</td>
<td>getActiveUsers()</td>
</tr>
<tr>
<td></td>
<td>Returns the active users.</td>
</tr>
<tr>
<td></td>
<td>Returns: Array - Returns the active users.</td>
</tr>
<tr>
<td>String</td>
<td>getChannelJID()</td>
</tr>
<tr>
<td></td>
<td>Returns the channel JID, which is a sys_id for a record chat_channel table.</td>
</tr>
<tr>
<td></td>
<td>Returns: String - Returns the channel JID.</td>
</tr>
<tr>
<td>String</td>
<td>getChatType()</td>
</tr>
<tr>
<td></td>
<td>Determines the chat window type.</td>
</tr>
<tr>
<td></td>
<td>Returns:</td>
</tr>
</tbody>
</table>
## Legacy: Help desk chat

Communicate with service desk staff using instant messaging.

**Note:** The [Connect Support](https://server=<instance web address>/ess) on page 499 feature provides an updated messaging platform similar to help desk chat. The help desk chat and Connect Support features should not be used concurrently. There is no migration path from help desk chat to Connect Support.

Users can communicate directly with service desk staff using instant messaging in a ServiceNow instance (requires the Chat plugin.)

- Users access live support from the Employee Self-Service portal.
- Service desk staff provide support from the chat desktop.

## Legacy: Use help desk chat to get support

You can contact service desk staff.

2. Log in to your ServiceNow account. Only logged in users can use chat.
3. In the upper right, click the Service Desk Chat button. A chat window opens.
4. Enter your question in the text field at the bottom of the window and press Enter.
   
   1. A message confirms that you have entered the chat queue and indicates your position and estimated wait time.
   
   2. When a service desk staff member accepts your chat and begins working on your question, another message appears.

5. Chat with your service desk agent via instant messaging.

   service desk staff may lead you through troubleshooting, ask clarifying questions, or create an incident record to address your question.

   Note: Administrators can configure Service Desk Chat to be accessible on content management (CMS) pages.

![Service Desk Chat Window](image)

Figure 261: Service Desk Chat Window

Legacy: Use help desk chat to provide support

Staff who are assigned to chat support can provide live support via instant messaging. Administrators and users with the chat_admin role can assign chat support staff (see Set Up Chat Queues for Help Desk Chat).

To provide users with live support using chat:

1. Navigate to Social IT Chat to open your chat desktop.
   
   • A chat queue agent window appears on your chat desktop for each chat queue you are assigned to. If no agent windows appear, ask an administrator to add you as a member of the assignment group for a chat queue.
• The chat queue agent window displays the number of users in the queue and how long they have been waiting.
• Every member of the assignment group sees the associated chat queue agent window.

2. Click Answer Next User to answer the next user or click Answer beside a specific user in the queue. A chat window opens.
• Only the agent and the user can see the chat window.

Provide support via instant messaging. Chat queue agents can access additional support functions in the chat window menu:
• Invite User: invite another expert to assist with a support chat. An invitation appears in the favorites list of an invited user.
• Create Incident from Chat: create a new incident record with the initial question as the short description and the support chat as a linked chat room (accessible from the Create or Join Chat Room related link on the Incident form).

Note: Administrators can edit this action or add additional actions to the chat window menu.
Legacy: Set up chat queues for help desk chat

Help desk chat allows users to communicate directly with Service Desk staff via instant messaging in an instance.

Chat queues define the schedules, staff, and system messages for help desk chat. Administrators and users with the chat_admin role can set up chat queues.

Define a chat queue for legacy chat

How to define a chat queue for legacy chat.

**Note:** The Chat Queue [chat_queue] table is also used by Connect Support on page 499. Legacy chat and Connect Support should not be used concurrently.

1. Navigate to Social IT Chat Administration Queues.
2. Select a chat queue to edit or click New.
3. Enter the chat queue details and click Update or Submit.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter the name that end users see as a title for the queue.</td>
</tr>
<tr>
<td>Active</td>
<td>Select the check box to activate or clear the check box to deactivate the chat queue.</td>
</tr>
<tr>
<td>Assignment group</td>
<td>Select the group that contains the support staff for the chat queue. Every agent sees the chat queue on their chat desktop and can answer any user that is waiting in the queue. To assign staff members to the group, see Assign Service Desk Staff to a Chat Queue.</td>
</tr>
<tr>
<td>Schedule</td>
<td>Select a schedule that defines when a queue is available (see Use Schedules). If the queue is always available, clear the field.</td>
</tr>
<tr>
<td>Question</td>
<td>Enter the initial question that end users see when they open a new Help Desk Chat. For example, How can I help you?</td>
</tr>
<tr>
<td>Confirm problem</td>
<td>(Optional) Enter the confirmation message that end users see when they enter an initial question. For example, Thank you for contacting support. Your problem has been submitted and an agent will be with you shortly.</td>
</tr>
<tr>
<td>Initial agent response</td>
<td>(Optional) Enter the message that end users see when an agent accepts their chat. For example, Thank you for waiting. I am looking into your question now and will be with you shortly.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Not available</td>
<td>Enter the message that end users see when a Help Desk Chat request is not accepted because the queue is outside its scheduled availability (defined by the Schedule field).</td>
</tr>
</tbody>
</table>

**Assign service desk staff to a chat queue**

Chat queue agents are Service Desk staff that are members of a chat queue's assignment group.

To assign agents to a chat queue:

1. Navigate to User Administration Groups.
2. Select an existing assignment group or click New.
3. Enter or modify the group details (see *Create a Group*).
4. Right-click the header and select Save.
5. In the Group members related list, click Edit.
6. Using the *slushbucket*, add support staff to the group.
7. Navigate to Social IT Chat Administration Queues.
8. Select the chat queue for which the group provides support.
9. In the Assignment Group field, select the group.

![Chat queue group](image-url)

**Figure 263: Chat queue group**
**Make help desk chat accessible to an end user**

Users access live support from the Employee Self-Service Portal (ESS Portal).

Users access live support from the Employee Self-Service Portal (ESS Portal). To make a Help Desk Chat queue accessible to end users, add a link to the ESS Portal (requires the Content Management Plugin).

To change the default link in the ESS header:

1. Navigate to Content Management Headers.
2. Open Portal - Header.
3. In the Chat queue field, enter the chat queue that users access by clicking the link in the ESS header. Clear the field to remove the chat queue link.
4. Click Update.

![Figure 264: Chat queue link](image)

**Add a custom link elsewhere on the ESS portal**

How to add a custom help desk chat link on the ESS portal.

1. Navigate to Content Management Static HTML.
2. Click New.
3. Enter a Name.
4. In the Static content field, click Toggle HTML Source to edit the field in HTML source mode.
5. Create a link to the desired Help Desk Chat queue (see Link Syntax).
6. Click Submit.
7. Add the new content block to the desired location on the portal (see Adding Content to the Page).

**Link syntax**

To open a Help Desk Chat queue from a custom link on the ESS Portal, you must call the CustomEvent.fire method using appropriate arguments.
To open a Help Desk Chat queue from a custom link on the ESS Portal, you must call the CustomEvent.fire method using appropriate arguments. Details of the API call and an example that generates an anchor link are provided below.

**API Call:**

```javascript
CustomEvent.fire(LiveEvents.LIVE_EVENT,
    LiveEvents.LIVE_WINDOW_JOIN_QUEUE_QUERY, CHAT_QUEUE_SYS_ID,
    CHAT_QUEUE_SYS_NAME);
```

where the variables are:

- **CHAT_QUEUE_SYS_ID**: Specifies the sys_id for the chat queue.
- **CHAT_QUEUE_SYS_NAME**: Specifies the name of the chat queue (must match the value the Name field of the chat queue record).

**Example:** This example creates an anchor link that opens the Help Desk Chat queue.

```html
<a href="#" onclick="CustomEvent.fire(LiveEvents.LIVE_EVENT,
    LiveEvents.LIVE_WINDOW_JOIN_QUEUE_QUERY,
    'c54f0afbf0a0a0b452db84664f409c79c',
    'Help Desk Chat'); return false;">Help Desk Chat</a>

Monitor chat queues

Chat queues can yield useful Key Performance Indicators (KPI) for evaluating support effectiveness.

- **Queue Wait Time**: amount of time a user waits in the queue before a help desk agent accepts the request.
- **Percentage of Chats Abandoned**: users that exit the queue before an agent responds (user stopped waiting).
- **Percentage of Chats Accepted**: requests that are answered by an agent.

---

**Note:** This information is not calculated automatically. Administrators may calculate these values based on data collected by chat queues.

Monitor help desk chat tasks

Help Desk Chat requests are tracked in the Chat queue entries table, which appears as a related list on the associated chat queue record.

Help Desk Chat requests are tracked in the Chat queue entries table, which appears as a related list on the associated chat queue record. Because this table extends the Task table, administrators can take advantage of core task functionality. For example, administrators can attach Service Level Agreements (SLAs) to chat queue entries to evaluate the response time of Help Desk Chat support.

---

### Credentials and connection information

Credentials and connection information are required to gain access to a computer or network device for Discovery, Service Mapping, and Cloud Management or to perform work using Orchestration. When adding content to Share or AppStore, you can configure connections and credentials relevant to your environment without modifying built content.

**Explore**

- [Upgrade to London](#)
- [Introduction to credentials, connections, and aliases](#) on page 1010

**Set up**

- [Create and test your credentials](#) on page 1023
**Introduction to credentials, connections, and aliases**

All application integrations in the ServiceNow platform use connection information, credentials, and aliases to enable their respective applications to access resources.

Before you can execute an application integration in your instance, you must create and configure the corresponding connection information and credentials. Connections pertain to an integration with a system, such as an IP address or endpoint with protocols. It contains specific details, such as database particulars, when integrating with a database. The associated credentials are the authentication data required to make the connection.

Connection information and credentials can vary between QA/Development/Production environments for the same integration. The tight coupling between this data and application metadata, such as workflow or job scheduling, make application metadata obsolete when you change environments. To alleviate this problem, the concept of an alias is introduced, to decouple connections and credentials from application metadata. These aliases allow customers to design their application metadata to pair with an alias, which resolves to connection and credential data during runtime.

There are two types of aliases, a **connection and credential alias** and a **credential alias**. Business rules enforce certain constraints on these aliases. Names must contain letters, numbers, and underscores, but cannot use special characters. The alias must be unique in a scope. If you choose to have multiple active connections, you can have more than one active connection in the same domain. If you do not choose this option, you can have only one active connection per domain.

**Note:** If you enable multiple active connections, the application picks one connection based on an established order. This order depends on the API you use to retrieve connection data.

You can add additional connection attributes to an alias, which are available in connection data during runtime. Variables overridden by connection administration during runtime should not affect the alias.

The credential alias resolves only credential data. Along with the alias data model, you can use a scriptable API that gets connection and credential data at runtime.

**Upgrading credential tags**

The upgrade process migrates credential tags to credential aliases. All credential tags in the Credentials [discovery_credentials] table have a corresponding credential alias with this information:
• Name: Unique alias name
• Scope: global
• ID: Alias name

Note: The credential tag field type changes from string to GlideList in the Credential table and the credential alias field refers to the created alias records.

Credential synchronization on MID Servers

Each MID Server in your network synchronized with the instance keeps a copy of every credential that you create. This synchronization speeds up the reading of credentials when applications like Discovery or Service Mapping need to access multiple devices on the network. The MID Servers synchronize when they find a credentials_reload job in the ECC Queue. The reload job instructs the MID Server to make a SOAP call to the instance to get the entire list of credentials in the Credentials [discovery_credentials] table, including all the field values.

The SOAP response that your instance sends to each MID Server also includes custom fields that you added to any credential form that you customized. If you added reference fields, the data in the referenced table is also sent as part of the SOAP response. This can lead to performance issues when credential synchronization occurs with multiple MID Servers. To control this, manually add these properties to the System Properties [sys_properties] table:

Note: To change the values in these properties, add them to the System Properties [sys_properties] table. If you do not add them, the system uses the default value.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>com.snc.credentials_user_fields</td>
<td>Includes all customized fields in credential sync. Set this to false if you do not want to include the fields that you added to credential forms.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td>com.snc.credentials_recursion_depth</td>
<td>Defines the number of tables to traverse when the credential sync mechanism collects fields from reference tables. Lower this number if you are experiencing performance issues and you have customized credential forms that include reference fields to tables that also have reference fields.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 3</td>
</tr>
</tbody>
</table>

Domain separation for Credentials and Connections

This is an overview of domain separation for Credentials and Connections. Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.
Overview

Support: Level 1

Domain separation is supported in this application. Not all ServiceNow applications support domain separation; some include limitations on the data and administrative settings that can be domain separated. To learn more, see Application support for domain separation.

Credentials are tied to various ServiceNow features which access systems outside the instance. Credentials follow the domain separation tied to the feature employing the credentials.

Connections are protocol-specific information referencing a target host outside the instance. A connection can specify the domain to run an activity.

How domain separation works in Credentials and Connections

Credentials access resources outside of the instance, and are used by the Discovery, Orchestration on page 1741, Service Mapping, and Cloud Management applications. These credentials are not tied to a specific domain, rather, they can be bound to an application and then follow the domain separation that the application uses. Credentials can also be assigned to a MID Server on page 1579, and then follow the domain separation specified by the MID Server configuration.

Connections access a target host using a JMS, JDBC, or HTTP(s) connection. You can specify global or a specific domain to which the connection belongs.

Create a Connection & Credential alias

Define an alias to label a credential or connection record.

- The admin role is required to create an alias.
- The credential_admin and connection_admin roles have read access to the alias record.

The Connection & Credential alias defines an alias that labels a credential or connection record. The alias contains these fields.

1. Navigate to Credentials & Connections Connection & Credential Aliases.
2. Click New.
3. Complete the fields.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the alias. Can only contain alpha, number, and underscore characters. During an upgrade, the tag in the credential record migrates to a Connection &amp; Credential Alias. If the credential tag contains special characters other than alphabets, numbers, and underscores, the tag name is preserved after the upgrade. You can still use this migrated alias, but you cannot update the alias until you change the name to meet the naming restrictions.</td>
</tr>
<tr>
<td>ID</td>
<td>This field is based on the format scope_name.alias_name. The ID must be unique. If the scope is global, the ID is the alias name. For example, if you create a workday alias in global scope, the ID is set to workday. If you create a workday alias in the HR app scope, the ID is set to x_hr_app.workday.</td>
</tr>
<tr>
<td>Type</td>
<td>Select either Credential or Connection and Credential. The default is Connection and Credential.</td>
</tr>
</tbody>
</table>
Create one or more connection records to associate with the alias. For more information about creating connections, see Setting up connections to target hosts on page 1014. Add connection attributes to the alias to make connection meta data available to flows in Flow Designer.

Create connection attributes

Define connection-specific variables that you can use in IntegrationHub integration steps.

- The admin role is required to create connection attributes.
- The connection_admin or admin role is required to assign attribute values.
- The action_designer or admin role is required to use attributes in a custom action.

Connection attributes are only used by integration steps, which require a subscription to IntegrationHub. For more information about activating IntegrationHub, see Request IntegrationHub on page 1329.

When using an integration step, you must establish a connection with an external system. Use a Connection & Credential alias instead of defining the connection inline. An alias enables you to update the connection details once without having to reconfigure every action. Any action step that uses an alias inherits the attributes associated with it. Flow Designer displays attributes as data pills that you can drag into your action step. For example, you can create a page size attribute that becomes a REST step query parameter.

For more information about building custom Flow Designer actions, see Action Designer on page 1283.

1. Navigate to Credentials & Connections Connection & Credential Aliases.
2. Create or select an alias record.
3. From the Connection Attributes related list, click New.
   The Connection Attributes form opens.
4. Define the attribute label and field type. For a list of field types, see field types.
5. Click the Advanced view related link to set advanced dictionary preferences for the attribute.
   For example, to create an attribute with a dynamically calculated value. See Dictionary entry form.
6. Click Submit.
7. Define the attribute values in the connection record.
   a) Navigate to Credentials & Connections Connections.
   b) Create or select a connection record with the same connection type as the alias.
   c) From Connection alias, select the alias with connection attributes.
   d) Save the record.
      The Attributes tab populates with the connection attributes defined in the alias record.
   e) Set values for the attributes.
      If the alias has Support Multiple Active Connections enabled, you can associate more than one
      connection record with an alias and define attribute values in each connection record. If there
      are multiple connection records with attribute values for the same alias, the connection used
      when the flow executes determines the attribute values. For example, suppose that you have one
      action that uses an alias with two active connections endpoints: production and test. The attribute
      resolves to the value defined by the connection used at runtime.

8. Add the alias to an integration step in Action Designer.
   a) Navigate to Flow Designer and create or select an action.
   b) Add an integration step to the action.
   c) Under Connection Details, add the alias you created attributes for.

   The connection attributes associated with the alias display as data pills in the Data pane.

   **Note:** The system does not track changes to connection attribute labels and data types after
   you associate the alias to a step. To refresh the connection attribute label or data type, delete
   the alias from the step and add it again.

**Setting up connections to target hosts**

Use the connections table to set up a Basic, JMS, JDBC, or HTTP(s) connection.

**Connection Table**

The Connection table (sys_connection) is the base table for all connection tables. You can set up
connections for the following protocols:

- Basic connection for PowerShell and SSH
- JDBC
- JMS
- HTTP(s)

The connection table references the connection alias table, which couples the connection alias to
connection information. Every connection records the following information:

**Table 350: Base connection properties**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the connection. This field must be unique on the table.</td>
</tr>
<tr>
<td>Credential</td>
<td>Specify the credential to use with this connection. This is optional.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Connection alias</td>
<td>The connection alias resolves your connection and credentials at run time. Only one connection is active per Connection alias at any one time.</td>
</tr>
<tr>
<td>Active</td>
<td>Check to make the current connection active.</td>
</tr>
<tr>
<td>Domain</td>
<td>Domain to which the connection belongs.</td>
</tr>
</tbody>
</table>

Credential is unique across active connections, if not empty.

**Upgrading connection information**

- The JDBC connection [jdbc_connection] and JMS connection [orch_jms_ds] tables are existing Orchestration connection tables that now extend from the Connection [sys_connection] table. The tables originally extended from sys_metadata. The sys_metadata related data is removed.
- The tables move from the Orchestration run time plugin [com.snc.runbook_automation.runtime] to the Credentials & Connections plugin.
- The upgrade process obtains JDBC and JMS connection information and creates corresponding connection aliases and assigns the alias to its corresponding connection.
- JDBC field name changes:
  - JDBC server is renamed to host
  - Database port is renamed to port
  - Data of the JDBC server and database migrates to host and port during the upgrade

Create a basic connection for PowerShell and SSH

Configure connection information to use with a custom activity or action that uses the PowerShell or Secure Shell (SSH) protocol.

Role required: admin or connection_admin

1. Navigate to Credentials & Connections Connections.
2. Click New.
3. Select Basic Connection for PowerShell & SSH.
4. Complete the form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Unique name of the connection record.</td>
</tr>
<tr>
<td>Credential</td>
<td>Select the credential record used to authorize the connection.</td>
</tr>
<tr>
<td>Connection alias</td>
<td>Select the alias record to associate with this connection. Using an alias enables you to update the connection record without having to reconfigure any actions or activities that use the alias.</td>
</tr>
<tr>
<td>Host</td>
<td>Fully qualified domain name of the target host where the system runs the activity or action. For example, host.domain.com.</td>
</tr>
<tr>
<td>Use MID Server</td>
<td>Select to connect to the target host through a MID Server. If selected, define fields in the Advanced MID Server Configuration section.</td>
</tr>
</tbody>
</table>

**Note:** PowerShell requires a MID Server.
## Create an HTTP(s) connection

The HTTP(s) connection provides the information custom HTTP(s) actions or activities use to connect.

### Role required: connection_admin

1. Navigate to **Credentials & Connections > Connections**, click **New**, and select **HTTP(s) Connection**.
2. Add the following connection information and click Submit:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Unique name of this HTTP(s) connection.</td>
</tr>
<tr>
<td>Credential</td>
<td>Select the credential record used to authorize the connection.</td>
</tr>
<tr>
<td>Connection Alias</td>
<td>Select the alias record to associate with this connection. Using an alias enables you to update the connection record without having to reconfigure any actions or activities that use the alias.</td>
</tr>
</tbody>
</table>

5. Click Submit.
<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
</table>
| **URL builder** | Either manually enter the connection URL or use system to build the URL based on the inputs. Default is unchecked. If checked, the connection URL is calculated from the following fields:  
  • Mutual authentication — Check box if mutual authentication is used.  
  • Protocol — If mutual authentication is not used, enter protocol. The default is HTTPS.  
  • Protocol profile — If mutual authentication is used, enter protocol profile from sys_protocol_profile.  
  • Host  
  • Port  
  • Base path — Path of the connection string.  

**Note:** If mutual authentication is checked, connection URL is built: Protocol + :// + host:port + URL. If mutual authentication is unchecked, connection URL is built: Protocol profile + :// + host:port + URL |

<table>
<thead>
<tr>
<th><strong>Connection URL</strong></th>
<th>If URL builder is unchecked, enter the connection URL into this field.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Active</strong></td>
<td>Check the box to make this connection active.</td>
</tr>
<tr>
<td><strong>Domain</strong></td>
<td>Determine the domain the action or activity runs in.</td>
</tr>
<tr>
<td><strong>Use MID server</strong></td>
<td>Check to use a MID Server for this action or activity. If selected, define fields in the Advanced MID Server Configuration section.</td>
</tr>
</tbody>
</table>
| **Capabilities**   | The capabilities the MID Server must support to be eligible for selection. The system runs the action or activity from a MID Server that supports the selected capabilities. Only displays if Use MID server is selected.  
  Required capabilities determine which MID Server is selected at runtime. To learn more about how a MID Server is selected during runtime, see *MID Server selection* on page 1630. |
| **MID Application**| The application the MID Server must support to be eligible for selection. The system runs the action from a MID Server that supports the selected application. Only displays if Use MID server is selected.  
  To learn more about how a MID Server is selected during runtime, see *MID Server selection* on page 1630. |
3. Click Submit.
   You are ready to create a custom HTTP(s) action or activity.

Create a JDBC connection

The JDBC Connection provides the information custom JDBC actions or activities use to connect to various target databases.

You must have an appropriate JAR file, whether it is supplied with the instance or a custom JAR file.

Note: The ServiceNow instance supplies mysql-connector-java-5.1.21.jar, sql-server-jdbc-4.0.jar, and ojdbc6.jar files as part of the current release, which supports MySQL, SQLServer, and Oracle databases. Other databases, such as Sybase or DB2 Universal, must use a custom JAR file that must be uploaded to the instance before setting the JDBC connection.

Role required: connection_admin

JDBC credentials are retrieved separately by the activity designer template and support external credential storage, such as CyberArk.

1. Navigate to Credentials & Connections Connections, click New and select JDBC Connection.
2. Complete the form using the fields in the table.
   The database selection in the Format field determines which fields are available.

Table 351: JDBC connection fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Database Format</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>All</td>
<td>Unique name of this JDBC connection. For example, you might enter JDBC MySQLProd.</td>
</tr>
<tr>
<td>Credential</td>
<td>All</td>
<td>Add credentials for JDBC provider.</td>
</tr>
<tr>
<td>Connection alias</td>
<td>All</td>
<td>Select the alias record to associate with this connection. Using an alias enables you to update the connection record without having to reconfigure any actions or activities that use the alias.</td>
</tr>
<tr>
<td>Query timeout</td>
<td>All</td>
<td>Maximum elapsed time the JDBC query is allowed to run without a response.</td>
</tr>
<tr>
<td>Connection timeout</td>
<td>All</td>
<td>Maximum elapsed time for the JDBC activity to wait while attempting to connect to the target database.</td>
</tr>
<tr>
<td>Active</td>
<td>All</td>
<td>Check the box to make this an active connection.</td>
</tr>
<tr>
<td>Domain</td>
<td>All</td>
<td>Domain for this table. By default, the JDBC Connection [jdbc_connection] table runs in the global domain.</td>
</tr>
<tr>
<td>Field</td>
<td>Database Format</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------</td>
<td>-------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Format</td>
<td>All</td>
<td>Database type for this connection. The default choices are:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• MySQL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Oracle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• SQLServer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>You can add Sybase or DB2 Universal to the choice list by uploading the appropriate JDBC driver JAR file to the instance. Orchestration automatically recognizes these drivers when they are loaded into the system and adds them to this list.</td>
</tr>
<tr>
<td>Host</td>
<td>Oracle, MySQL, SQLServer</td>
<td>Host name or IP address of the database server.</td>
</tr>
<tr>
<td>Oracle sid</td>
<td>Oracle</td>
<td>The Oracle database site identifier. The default value is orcl.</td>
</tr>
<tr>
<td>Oracle port</td>
<td>Oracle</td>
<td>Port that the Oracle database is using. The default value is 1521.</td>
</tr>
<tr>
<td>Database name</td>
<td>MySQL, SQLServer</td>
<td>Name of the database.</td>
</tr>
<tr>
<td>Port</td>
<td>MySQL, SQLServer</td>
<td>Port that the selected database is using.</td>
</tr>
<tr>
<td>Instance name</td>
<td>SQLServer</td>
<td>Instance name for the selected SQLServer</td>
</tr>
<tr>
<td>Connection URL</td>
<td>All</td>
<td>URL that the MID Server uses to connect to the specified database. The URL is created automatically when you save the form, and is read-only for the default databases.</td>
</tr>
</tbody>
</table>

**Note:** If the format selected is not one of the default databases, you must create the connection URL manually so that the MID Server knows how to create the connection.

| JDBC driver      | None, DB2 Universal, Sybase | The JDBC driver to use for this connection when it is not a default database. |

**Note:** If you add a Sybase or DB2 Universal database, you must enter the driver name in this field and upload the driver JAR file to the instance.

| Use MID server   | All             | Check to use a MID server for this action or activity. If selected, define fields in the Advanced MID Server Configuration section. |
### Field | Database Format | Description
---|---|---
Capabilities | All | The capabilities the MID Server must support to be eligible for selection. The system runs the action or activity from a MID Server that supports the selected capabilities. Only displays if Use MID server is selected. To learn more about how a MID Server is selected during runtime, see *MID Server selection* on page 1630.

MID Application | All | The application the MID Server must support to be eligible for selection. The system runs the action from a MID Server that supports the selected application. Only displays if Use MID server is selected. To learn more about how a MID Server is selected during runtime, see *MID Server selection* on page 1630.

3. Click Submit.

### Create a JMS connection

Configure your system to use Java Messaging Service (JMS) with a custom JMS activity or action.

**Role required:** connection_admin

The MID Server must have the correct JMS connection factories for your organization. Configure those values in the mid.property.jms.command.allowed_factory_names property, found in *MID Server Properties*. The default values for this property can be changed to any value or comma-separated list of values that the third-party JMS provider advertises.

1. Navigate to **Credentials & Connections > Connections**.
2. Click **New**, select **JMS Connection**, fill in the form, and then click **Submit**:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name</strong></td>
<td>Unique name of this connection factory.</td>
</tr>
<tr>
<td><strong>Credential</strong></td>
<td>Add credentials for JMS provider.</td>
</tr>
<tr>
<td><strong>Connection Alias</strong></td>
<td>Select the alias record to associate with this connection. Using an alias enables you to update the connection record without having to reconfigure any actions or activities that use the alias.</td>
</tr>
<tr>
<td><strong>Initial Context Factory</strong></td>
<td>Name of the JNDI class that is used to create the InitialContext.</td>
</tr>
</tbody>
</table>

**Note:** For example, to connect to ActiveMQ V5.10 (JMS Provider), the value is org.apache.activemq.jndi.ActiveMQInitialContextFactory
<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provider URL</td>
<td>Location of the running JMS provider installation.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> For example, to connect to ActiveMQ V5.1: tcp://ipAddressOrHostName:61616.</td>
</tr>
<tr>
<td>Active</td>
<td>Check the box to make this an active connection.</td>
</tr>
<tr>
<td>Domain</td>
<td>Determine the domain the action or activity runs in.</td>
</tr>
<tr>
<td>Use MID server</td>
<td>Check to use a MID Server for this action or activity. If selected, define fields in the Advanced MID Server Configuration section.</td>
</tr>
<tr>
<td>Capabilities</td>
<td>The capabilities the MID Server must support to be eligible for selection. The system runs the action or activity from a MID Server that supports the selected capabilities. Only displays if Use MID server is selected.</td>
</tr>
<tr>
<td></td>
<td>To learn more about how a MID Server is selected during runtime, see <a href="#">MID Server selection</a> on page 1630.</td>
</tr>
<tr>
<td>MID Application</td>
<td>The application the MID Server must support to be eligible for selection. The system runs the action from a MID Server that supports the selected application. Only displays if Use MID server is selected.</td>
</tr>
<tr>
<td></td>
<td>To learn more about how a MID Server is selected during runtime, see <a href="#">MID Server selection</a> on page 1630.</td>
</tr>
</tbody>
</table>

4. Click New, select JMS Credentials, and then provide the user name and password the MID should use to communicate with the JMS provider.
   For more information, see [JMS credentials](#) on page 1039.
5. Click Submit.
   You are ready to create a custom JMS action or activity.

### Getting started with credentials

The MID Server uses the credentials you create in the Credentials [discovery_credentials] table to access resources for Discovery, Orchestration, Service Mapping, and Cloud Management.

### How MID Servers use credentials

By default, Windows MID Servers use the login credentials of the MID Server service on the host machine to discover Windows devices in the network. You should [configure these service credentials](#) so that they
have at least local administrator privileges. For Linux and UNIX machines and network devices, the MID Server uses the SSH and SNMP credentials configured in the instance in Discovery Credentials.

MID Servers that Orchestration uses must have access to the necessary credentials to execute commands on computers in the network as specified by the Workflow activities. Orchestration can use the same SSH and SNMP credentials as Discovery, but has two additional credentials designed for specific Workflow activities: Windows (for PowerShell) and VMware.

Encryption and decryption

The platform stores credentials in an encrypted field on the Credentials [discovery_credentials] table. Once they are entered, they cannot be viewed.

When credentials are requested by the MID Server, the platform decrypts the credentials using the following process:

1. The credentials are decrypted on the instance with the password2 fixed key.
2. The credentials are re-encrypted on the instance with the MID Server's public key.
3. The credentials are encrypted on the load balancer with SSL.
4. The credentials are decrypted on the MID Server with SSL.
5. The credentials are decrypted on the MID Server with the MID Server’s private key.

Note: The platform does not have separate encryption keys for multi-tenant instances.

Credential order

Credentials can be assigned an order value in the Credentials Form, which forces the application to try all the credentials at their disposal in a certain sequence. If you do not specify an order value, the application tries the credentials in the Credentials [discovery_credential] table randomly, until it finds one that works, such as when Orchestration attempts to run a command on an SSH server (such as a Linux or UNIX machine), or when Discovery attempts to query an SNMP device (such as a printer, router, or UPS).

After identifying the credentials for a device, Discovery and Orchestration create an affinity between the credentials and the device using the Credential Affinity [dscy_credentials_affinity] table. All subsequent discoveries or Orchestration activities attempt to match the credentials in this table with a device for which an affinity exists. If credentials for a device change, Discovery and Orchestration try all available credentials again until they create a new affinity.

Note: If Orchestration and Discovery are installed, and credential alias is enabled, multiple affinities can exist. In this case, the platform looks up credentials for each affinity and inserts the credential for the affinity with the lowest order into the probe.

Ordering credentials is useful in the following situations:

• The credentials table contains many credentials, with some used more frequently than others. For example, if the table contains 150 SSH credentials, and 5 of those are used to log into 90% of the devices, it is good practice to configure those five with low order numbers, which places them at the top of the execution list. Discovery and Orchestration will work faster if they try these common credentials first. After the first successful connection, the system knows which credentials to use the next time for each device.
• The system has aggressive login security. For example, if the Solaris database servers in the network only allow three failed login attempts before they lock out the MID Server, configure the database credentials with a low order value.

**Credential alias**

Credential alias allows flow and workflow creators to:
• Assign individual credentials to any activity in an Orchestration workflow
• Assign individual credentials to any action in Flow Designer
• Assign different credentials to each occurrence of the same activity type in an Orchestration workflow.
• Assign different credentials to each occurrence of the same action in designer flow.

Credential alias also works with credential affinities.

**External credential stores**

If you do not want credentials stored in your instance, you can use external credential repositories. External credential stores save the credentials in an external site that your instance can access. Only CyberArk is supported.

**Create and test your credentials**

Create and test the credentials that Discovery, Service Mapping, Cloud Management, and Orchestration require to access hardware and software in your network.

Role required: admin

This task contains general procedures for creating credentials. Refer to the documentation for your credential type for details on specific fields and requirements.

<table>
<thead>
<tr>
<th>Table 352: Supported credential types</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Applicative credentials</strong> on page 1028</td>
</tr>
<tr>
<td><strong>Basic authentication credentials</strong> on page 1029</td>
</tr>
<tr>
<td><strong>Chef server credentials</strong> on page 1030</td>
</tr>
<tr>
<td><strong>CIM credentials</strong> on page 1031</td>
</tr>
<tr>
<td><strong>Cloud credentials</strong> on page 1032</td>
</tr>
<tr>
<td><strong>Infoblox credentials</strong> on page 1036</td>
</tr>
<tr>
<td><strong>JDBC credentials</strong> on page 1037</td>
</tr>
<tr>
<td><strong>JMS credentials</strong> on page 1039</td>
</tr>
<tr>
<td><strong>OAuth 2.0 credentials</strong> on page 1040</td>
</tr>
<tr>
<td><strong>SAP credentials</strong> on page 1041</td>
</tr>
<tr>
<td><strong>SNMP credentials</strong> on page 1042</td>
</tr>
<tr>
<td><strong>SSH credentials</strong> on page 1045</td>
</tr>
<tr>
<td><strong>VMware credentials</strong> on page 1053</td>
</tr>
<tr>
<td><strong>Windows credentials</strong></td>
</tr>
</tbody>
</table>

1. Navigate to one of these modules:
   • Discovery Credentials
   • Service Mapping Credentials
   • Orchestration Credentials
2. Click New.

3. On the Credentials page, click a link for the credential type and complete the form. Refer to the documentation for the credential type you selected for details.

You can submit a credential record first and then test it later, or test the credential immediately before saving it. The exceptions are Amazon Web Services (AWS) credentials, which must be saved prior to testing.

Credential testing is supported for these credential types:

- SSH (including private keys)
- Windows
- SNMP (including v3)
- VMware
- JDBC
- JMS
- AWS

4. Under Related Links, click Test credential.

The test runs immediately for AWS credentials. There are no test fields to complete for these credentials, because they do not use a MID Server and are based on the account specified in the credentials record.

**Note:** Credentials are encrypted at all times during the test.

5. For all other credential types, complete the fields in the Test Credential dialog box.

![Test Credential dialog box](image)
### Table 353: Credential test fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
<th>Credential type</th>
</tr>
</thead>
</table>
| Target            | Target host on which these credentials are run. This value must be an IP address for all credential types except VMware, which can be the host URL.  

  **Note:** For JMS, this is the provider URL. The information in this URL tells JNDI how to find and access the JMS Provider. An example value for connecting to ActiveMQ V5.1, is `tcp://ipAddressOrHostName:61616`.  

<table>
<thead>
<tr>
<th>Port</th>
<th>Port on the target to use for this test. The system pre-populates this field with the default port for the selected credential type.</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>MID Server</td>
<td>MID Server to use for this test. You must use a Windows MID Server to test Windows credentials. Only Up and Validated MID Servers are available.</td>
<td>All</td>
</tr>
<tr>
<td>DB Type</td>
<td>Type of database on which to test these credentials.</td>
<td>JDBC</td>
</tr>
<tr>
<td>DB Name</td>
<td>Name of the database on which to test these credentials.</td>
<td>JDBC</td>
</tr>
<tr>
<td>Initial Context Factory</td>
<td>Name of the JNDI class that is used to create the InitialContext. Using this Initial Context Factory, various JMS objects, such as JMS Connection, are created. For example, to connect to ActiveMQ V5.10, (JMS Provider), the value in this field would be <code>org.apache.activemq.jndi.ActiveMQInitialContextFactory</code></td>
<td>JMS</td>
</tr>
</tbody>
</table>
6. Click OK to begin the test. An indicator appears, showing that the system is attempting to contact the target using the credentials you have provided. When the instance connects to the target it displays a success message. If the instance encounters a problem with the test inputs you have provided, it displays the appropriate error message. The following are some common error messages.

- Incorrect target or port number:

![Figure 267: TCP connection failure](image)

7. Click Retry to open the test Credential dialog box and correct the input error.

8. When your credentials test is successful, click Submit to save the record.

**Important:** Testing credentials does not ensure that the credentials have the necessary privileges required for the intended Discovery or Orchestration workflow tasks.

### Ansible Tower credentials

Ansible Tower credentials are required to access your Ansible configuration management account. Use these credentials to manage Ansible resources through the Cloud Management application.
To integrate Cloud Management with the Ansible configuration management account, you only need to configure the user name and password for the administrator account in Ansible.

### Table 354: Form fields for Ansible Tower credentials

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Provide a descriptive name.</td>
</tr>
<tr>
<td>User name/Password</td>
<td>Enter the authentication credentials for the Ansible Tower user with administrator rights.</td>
</tr>
</tbody>
</table>

**Note:** You do not need to configure the other fields.

#### API key credentials

An API key is a unique code that is passed in to an API to identify the calling application or user.

### Table 355: API key credentials form fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Input value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a unique and descriptive name for this credential.</td>
</tr>
<tr>
<td>Active</td>
<td>Enable or disable these credentials for use.</td>
</tr>
<tr>
<td>API Key</td>
<td>Enter the API key.</td>
</tr>
<tr>
<td>Credential alias</td>
<td>Allow flow and workflow creators to assign individual credentials to any activity in a flow or workflow or assign different credentials to each occurrence of the same activity type in a flow or workflow.</td>
</tr>
<tr>
<td>Applies to</td>
<td>Select whether to apply these credentials to All MID servers in your network, or to one or more Specific MID servers. Specify the MID Servers that should use these credentials in the MID servers field.</td>
</tr>
<tr>
<td>Order</td>
<td>Enter the order (sequence) in which the platform tries this credential as it attempts to log on to devices. The smaller the number, the higher in the list this credential appears. Establish credential order when using large numbers of credentials or when security locks out users after three failed login attempts. If all the credentials have the same order number (or none), the instance tries the credentials in a random order.</td>
</tr>
</tbody>
</table>
Applicative credentials

Some applications require credentials in addition to the credentials the host machine requires. Credentials required to access these applications are referred to as applicative credentials.

A typical credential contains a user name and a password for logging into a device or application. While most applications require only one credential for accessing them, sometimes hosts and applications have separate credentials for extra security. For example, ABAP SAP Central Services (ASCS) requires applicative credentials in addition to the SSH or Windows host credentials for the server that hosts ASCS.

**Note:** ServiceNow applications refer to devices and applications that comprise an application service as configuration items (CIs).

Just like with host credentials, you assign applicative credentials to MID Servers.

You create applicative credentials per CI type, for example the CI type for ASCS is SAP ASCS Application [cmdb_ci_appl_sap_ascs]. The preconfigured pattern for discovering CIs belonging to this CI type contains commands that require a MID Server to use the applicative credential for this CI type. If there is more than one credential configured for this CI type, the MID Server tries using these credentials in the order you define until it finds the credential that fits.

Check the discovery requirements information in the ServiceNow documentation to determine if you need to configure applicative credentials for specific application CIs. There is no need to configure applicative credentials, if discovery prerequisites do not mention it.

**Table 356: Applicative credentials form fields**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the credential. Use a descriptive name like Oracle DB or London Oracle DB (for an Oracle database).</td>
</tr>
<tr>
<td>Active</td>
<td>Select the check box to use the credential.</td>
</tr>
<tr>
<td>User name</td>
<td>Enter the actual user name of the applicative credential.</td>
</tr>
<tr>
<td>Password</td>
<td>Enter the actual password of the applicative credential.</td>
</tr>
<tr>
<td>CI type</td>
<td>Select a CI type to which the CI belongs.</td>
</tr>
<tr>
<td>Credential alias</td>
<td>Enter the table name for the CI type whose applicative credentials the application uses. Applications may use applicative credentials of a CI type different from their own.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
</tr>
<tr>
<td>SAP NetWeaver Dialog Instance</td>
<td>cmdb_ci_appl_sap_ascs</td>
</tr>
<tr>
<td>Microsoft Exchange Mailbox (for Microsoft Exchange)</td>
<td>cmdb_ci_exchange_mailbox</td>
</tr>
<tr>
<td>Microsoft SQL Database</td>
<td>cmdb_ci_db_mssql_instance</td>
</tr>
<tr>
<td>MySQL Server</td>
<td>cmdb_ci_db_mysql_instance</td>
</tr>
<tr>
<td>Oracle Advanced Queue Queue</td>
<td>cmdb_ci_db_ora_instance</td>
</tr>
<tr>
<td>Oracle Database</td>
<td>cmdb_ci_db_ora_instance</td>
</tr>
<tr>
<td>Oracle E-Business Suite</td>
<td>cmdb_ci_db_ora_instance</td>
</tr>
<tr>
<td>Oracle WebLogic Module</td>
<td>cmdb_ci_app_server_weblogic</td>
</tr>
<tr>
<td>Tibco EMS Queue</td>
<td>cmdb_ci_appl_tibco_message</td>
</tr>
<tr>
<td>Tibco Enterprise Message Service (EMS)</td>
<td>cmdb_ci_appl_tibco_message</td>
</tr>
</tbody>
</table>

**Applies to**
Select whether to apply these credentials to All MID servers in your network, or to one or more Specific MID servers. Specify the MID Servers that should use these credentials in the MID servers field.

**Order**
Enter the order (sequence) in which the platform tries this credential as it attempts to log on to devices. The smaller the number, the higher in the list this credential appears. Establish credential order when using large numbers of credentials or when security locks out users after three failed login attempts. If all the credentials have the same order number (or none), the instance tries the credentials in a random order.

---

**Basic authentication credentials**
The basic authentication credential type manages access to store basic authentication credentials. These fields are available in the Credentials form for basic authentication.

<table>
<thead>
<tr>
<th>Field</th>
<th>Input value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a unique and descriptive name for this credential. For example, you might call it Basic Authentication.</td>
</tr>
<tr>
<td>User Name</td>
<td>Enter the user name.</td>
</tr>
<tr>
<td>Password</td>
<td>Enter the password.</td>
</tr>
</tbody>
</table>
### London ServiceNow Now Platform Capabilities

<table>
<thead>
<tr>
<th>Field</th>
<th>Input value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credential ID</td>
<td>Enter the unique key configured for these credentials in the CyberArk external credential storage system. The credential ID may be used as a safe override when multiple safes are in use. By default, the syntax in the Credential ID field is this: <code>&lt;safe name&gt;:&lt;Credential ID&gt;</code>. If the safe name is omitted, there must be a safe name defined in the config.xml file. To change the separator character from the default colon to another character, override the value with the optional <code>ext.cred.safe_name</code> parameter. The Credential ID field has a limit of 40 characters. This field is only visible when the External storage check box is selected.</td>
</tr>
<tr>
<td>External credential store</td>
<td>Select this check box to use an external credential storage system. When you select this option the User name and Password fields are replaced with the Credential ID field. Currently, the only supported external storage system is CyberArk.</td>
</tr>
<tr>
<td>Order</td>
<td>Enter the order (sequence) in which the platform tries this credential as it attempts to log on to devices. The smaller the number, the higher in the list this credential appears. Establish credential order when using large numbers of credentials or when security locks out users after three failed login attempts. If all the credentials have the same order number (or none), the instance tries the credentials in a random order.</td>
</tr>
</tbody>
</table>

### Chef server credentials

Chef server credentials access chef integrations with the instance.

These fields are available on the Credentials form for Chef server type credentials. This information comes from the settings you configured when you performed \textit{Chef server installation}.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a unique and descriptive name for this credential.</td>
</tr>
<tr>
<td>Active</td>
<td>Enable or disable these credentials for use.</td>
</tr>
<tr>
<td>Admin Name</td>
<td>Provide the administrator name that you created during Chef server installation.</td>
</tr>
<tr>
<td>Admin Key</td>
<td>Enter the RSA private key that the Chef server generated when you created the administrator.</td>
</tr>
<tr>
<td>Validator Name</td>
<td>Enter the validator.</td>
</tr>
<tr>
<td>Validator Key</td>
<td>Enter the RSA private key that the Chef server generated when you created an organization.</td>
</tr>
</tbody>
</table>
### CIM credentials

The CIM credential type manages access to a CIM server (also referred to as a CIMOM - Common Information Model Object Manager) for information about VMware ESX servers. This credential type is available for Discovery.

These fields are available in the Credentials form for CIM.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a unique and descriptive name for this credential.</td>
</tr>
<tr>
<td>Active</td>
<td>Enable or disable these credentials for use.</td>
</tr>
<tr>
<td>User name</td>
<td>Enter the user name to create in the Credentials table. Avoid leading or trailing spaces in user names. A warning appears if the platform detects leading or trailing spaces in the user name. For CIM discovery, the user must have the admin role.</td>
</tr>
<tr>
<td>Credential ID</td>
<td>Enter the unique key configured for external credentials in the JAR file uploaded to the MID Server for an external credential system. The Credential ID field has a limit of 40 characters. This field is only visible when the External credential store check box is selected.</td>
</tr>
<tr>
<td>Credential alias</td>
<td>Allow workflow creators to assign individual credentials to any activity in an Orchestration workflow or assign different credentials to each occurrence of the same activity type in an Orchestration workflow. To use the credential for discovering CIs not belonging to this CI type using Service Mapping and Discovery patterns, enter the table name for the CI type to which the CI belongs, for example cmdb_ci_apache_web_server. For more information, see Change credentials to non-default.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>External credential store</td>
<td>Select this check box to use an external credential storage system. When you select this option the User name and Password fields are replaced with the Credential ID field. <em>External credential storage</em> is only available when the External Credential Storage plugin is activated.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Currently, the only supported external storage system is <em>CyberArk</em>.</td>
</tr>
<tr>
<td>Applies to</td>
<td>Select whether to apply these credentials to All MID servers in your network, or to one or more Specific MID servers. Specify the MID Servers that should use these credentials in the MID servers field.</td>
</tr>
<tr>
<td>MID servers</td>
<td>Select one or more MID Servers from the list of available MID Servers. The credentials configured in this record are available to the MID Servers in this list. This field is available only when you select Specific MID servers from the Applies to field.</td>
</tr>
<tr>
<td>Order</td>
<td>Enter the order (sequence) in which the platform tries this credential as it attempts to log on to devices. The smaller the number, the higher in the list this credential appears. Establish credential order when using large numbers of credentials or when security locks out users after three failed login attempts. If all the credentials have the same order number (or none), the instance tries the credentials in a random order.</td>
</tr>
</tbody>
</table>

_Configure NetApp storage devices for CIM credentials_

NetApp storage devices require additional configuration in order for Discovery to explore them.

Role required: admin

1. Install the _SMI-S agent_ on the storage device host. See the _Data ONTAP SMI-S Agent 5.2 Installation and Configuration Guide_ for instructions and requirements.

   **Note:**
   
   ServiceNow does not maintain the documentation on this site. Be aware that this document can change without notice.

2. Create a user account and password for the SMI-S agent.
3. Create a credential record for the SMI-S agent credentials. Set the credential type to CIM.

_Cloud credentials_

Cloud credential types manage access to cloud-based applications, including Amazon Web Services and the Microsoft Azure cloud.
AWS credentials

Table 358: AWS Credentials form fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Input value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>Select the check box to use the credential.</td>
</tr>
<tr>
<td>Access Key ID</td>
<td>Enter the Access key ID that you generated on the AWS Management Console. For example, APIAIOSFODNN7EXAMPLE.</td>
</tr>
<tr>
<td>Secret Access Key</td>
<td>Enter the Secret access key that you generated on the AWS Management Console. For example, wPalrXUtFEMIK7MDENG/bPxFiCYEXAMPLEKEY.</td>
</tr>
</tbody>
</table>

Azure Service Principal credentials

Table 359: Azure Service Principal credentials form fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter the name of the service principal to register with the instance.</td>
</tr>
<tr>
<td>Tenant ID and</td>
<td>Paste the Azure Directory ID value from the Azure portal into the Cloud Management Tenant ID field.</td>
</tr>
<tr>
<td>Client ID</td>
<td>Paste the Azure Application ID value of the application that you registered in Azure into the Cloud Management Client ID field.</td>
</tr>
<tr>
<td>Authentication Method</td>
<td>Select Client secret.</td>
</tr>
<tr>
<td>Note:</td>
<td>Client assertion is not supported.</td>
</tr>
<tr>
<td>Secret key</td>
<td>Paste the secret key that was generated while creating the Azure Service Principal. This field appears when Authentication method is Client secret.</td>
</tr>
</tbody>
</table>

Azure Enterprise Agreement credentials

Azure Enterprise Agreement credentials are necessary for the billing functionality that the Cloud Management application provides.
Table 360: Azure Enterprise Agreement credentials form fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a descriptive name.</td>
</tr>
<tr>
<td>Enrollment number</td>
<td>Enter the enrolment number from Azure.</td>
</tr>
<tr>
<td>Access Key</td>
<td>Paste the access key that Azure provides.</td>
</tr>
</tbody>
</table>

Cloud Management credentials

This credential type is available for Orchestration.

Table 361: Cloud Management credentials form fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Input value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a unique and descriptive name for this credential. For example, you might call it Cloud Atlanta.</td>
</tr>
<tr>
<td>Active</td>
<td>Enable or disable these credentials for use.</td>
</tr>
<tr>
<td>Type</td>
<td>Specify AWS.</td>
</tr>
<tr>
<td>User name</td>
<td>Enter the CIM user name to create in the Credentials table. Avoid leading or trailing spaces in user names. A warning appears if the platform detects leading or trailing spaces in the user name.</td>
</tr>
<tr>
<td>Password</td>
<td>Enter the CIM password.</td>
</tr>
<tr>
<td>SSH Passphrase</td>
<td>Enter a memorable phrase for key generation. For example, you might enter Friday is a good day.</td>
</tr>
<tr>
<td>SSH private key</td>
<td>Enter the SSH private key.</td>
</tr>
<tr>
<td>Authentication protocol</td>
<td>Select the MD5 or SHA authentication protocol that was used to generate the Authentication Key.</td>
</tr>
<tr>
<td>Authentication Key</td>
<td>Enter a SSH-generated authentication key.</td>
</tr>
<tr>
<td>Privacy protocol</td>
<td>Enter one of the following privacy protocols that describes encryption for the Privacy Key:</td>
</tr>
<tr>
<td></td>
<td>• 3DES for Triple Data Encryption Standard (DES)</td>
</tr>
<tr>
<td></td>
<td>• AES128 for Advanced Encryption Standard (AES) with 128 bit encryption</td>
</tr>
<tr>
<td></td>
<td>• AES192 for AES with 192 bit encryption</td>
</tr>
<tr>
<td></td>
<td>• AES256 for AES with 256 bit encryption</td>
</tr>
<tr>
<td></td>
<td>• DES for legacy DES encryption</td>
</tr>
</tbody>
</table>

Enter an additional privacy key.
<table>
<thead>
<tr>
<th>Field</th>
<th>Input value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credential alias</td>
<td>Allow workflow creators to assign individual credentials to any activity in an Orchestration workflow or assign different credentials to each occurrence of the same activity type in an Orchestration workflow.</td>
</tr>
<tr>
<td>External credential store</td>
<td>Select this check box to use an external credential storage system. When you select this option the User name and Password fields are replaced with the Credential ID field. Currently, the only supported external storage system is CyberArk.</td>
</tr>
<tr>
<td>Applies to</td>
<td>Select whether to apply these credentials to All MID servers in your network, or to one or more Specific MID servers. Specify the MID Servers that should use these credentials in the MID servers field.</td>
</tr>
<tr>
<td>Classification</td>
<td>Enter the Application Classification for CI discovery.</td>
</tr>
<tr>
<td>Order</td>
<td>Enter the order (sequence) in which the platform tries this credential as it attempts to log on to devices. The smaller the number, the higher in the list this credential appears. Establish credential order when using large numbers of credentials or when security locks out users after three failed login attempts. If all the credentials have the same order number (or none), the instance tries the credentials in a random order.</td>
</tr>
</tbody>
</table>

**Cloud Management (CMP) node credentials**

Cloud Management (CMP) node credentials associate credentials for a virtual server that Cloud Management provisions. The Cloud Management application automatically creates these credentials.

**Note:** You might need to deactivate these credentials if you no longer want them used, change the order precedence, or select a MID Server that is allowed to access them. Otherwise, you do not need to manually create or modify this type of credential.

**Table 362: CMP node credentials form fields**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The automatically generated name based on the datacenter where the virtual machine is located.</td>
</tr>
<tr>
<td>Active</td>
<td>If the credentials are active.</td>
</tr>
<tr>
<td>Applies to</td>
<td>Choose whether this credential is available to a specific MID Server or all MID Servers.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Order</td>
<td>Enter the order (sequence) in which the platform tries this credential as it attempts to log on to devices. The smaller the number, the higher in the list this credential appears. Establish credential order when using large numbers of credentials or when security locks out users after three failed login attempts. If all the credentials have the same order number (or none), the instance tries the credentials in a random order.</td>
</tr>
<tr>
<td>User Name and Password</td>
<td>The virtual server user name and password.</td>
</tr>
<tr>
<td>SSH passphrase and SSH private key</td>
<td>The private key and the passphrase that protects the key if the virtual server requires it.</td>
</tr>
<tr>
<td>Authentication Protocol and Authentication Key</td>
<td>The private key and the passphrase that protects the key if the virtual server requires it.</td>
</tr>
<tr>
<td>Privacy Protocol and Privacy Key</td>
<td>The encryption protocol used with the virtual server and enter the privacy key.</td>
</tr>
<tr>
<td>Credential alias</td>
<td>Allow workflow creators to assign individual credentials to any activity in an Orchestration workflow or assign different credentials to each occurrence of the same activity type in an Orchestration workflow.</td>
</tr>
</tbody>
</table>

**Cloud Management (CMP) SSH key pair credentials**

Cloud Management (CMP) SSH key pairs store the keys that the Cloud Management application automatically generates when users provision stack resources.

*Note:* You might need to deactivate these credentials if you no longer want them used. Otherwise, you do not need to manually create or modify this type of credential.

**Table 363: CMP SSH key pair credentials form fields**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The automatically generated name.</td>
</tr>
<tr>
<td>Active</td>
<td>If the credentials are active.</td>
</tr>
<tr>
<td>SSH Public Key</td>
<td>The public key.</td>
</tr>
<tr>
<td>SSH Private Key</td>
<td>A secure private key that can be used instead of a password for SSH logins.</td>
</tr>
</tbody>
</table>
### Field | Description
--- | ---
Name | Enter a unique and descriptive name for this credential.
Active | Enable or disable these credentials for use.
Applies to | Choose whether this credential is available to a specific MID Server or all MID Servers.
Order | Enter the order (sequence) in which the platform tries this credential as it attempts to log on to devices. The smaller the number, the higher in the list this credential appears. Establish credential order when using large numbers of credentials or when security locks out users after three failed login attempts. If all the credentials have the same order number (or none), the instance tries the credentials in a random order.
wAPI Version | Enter the version of wAPI you are using.
User Name and Password | Enter the InfoBlox user name and password.

**JDBC credentials**

The JDBC credential type manages access to a Java Database Connectivity (JDBC) connection. This credential type is available for Discovery and Orchestration.

These fields are available in the Credentials form for JDBC type credentials.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a unique and descriptive name for this credential.</td>
</tr>
<tr>
<td>Active</td>
<td>Enable or disable these credentials for use.</td>
</tr>
<tr>
<td>User name</td>
<td>Enter the user name to create in the Credentials table. Avoid leading or trailing spaces in user names. A warning appears if the platform detects leading or trailing spaces in the user name. For CIM discovery, the user must have the admin role.</td>
</tr>
<tr>
<td>Password</td>
<td>Enter the password.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Credential ID</td>
<td>Enter the unique key configured for external credentials in the JAR file uploaded to the MID Server for an external credential system. The Credential ID field has a limit of 40 characters. This field is only visible when the External credential store check box is selected.</td>
</tr>
<tr>
<td>Credential alias</td>
<td>Allow workflow creators to assign individual credentials to any activity in an Orchestration workflow or assign different credentials to each occurrence of the same activity type in an Orchestration workflow. To use the credential for discovering CIs not belonging to this CI type using Service Mapping and Discovery patterns, enter the table name for the CI type to which the CI belongs, for example cmdb_ci_apache_web_server. For more information, see Change credentials to non-default.</td>
</tr>
<tr>
<td>External credential store</td>
<td>Select this check box to use an external credential storage system. When you select this option the User name and Password fields are replaced with the Credential ID field. External credential storage is only available when the External Credential Storage plugin in activated. Note: Currently, the only supported external storage system is CyberArk.</td>
</tr>
<tr>
<td>Applies to</td>
<td>Select whether to apply these credentials to All MID servers in your network, or to one or more Specific MID servers. Specify the MID Servers that should use these credentials in the MID servers field.</td>
</tr>
<tr>
<td>MID servers</td>
<td>Select one or more MID Servers from the list of available MID Servers. The credentials configured in this record are available to the MID Servers in this list. This field is available only when you select Specific MID servers from the Applies to field.</td>
</tr>
<tr>
<td>Order</td>
<td>Enter the order (sequence) in which the platform tries this credential as it attempts to log on to devices. The smaller the number, the higher in the list this credential appears. Establish credential order when using large numbers of credentials or when security locks out users after three failed login attempts. If all the credentials have the same order number (or none), the instance tries the credentials in a random order.</td>
</tr>
</tbody>
</table>
JMS credentials

The JMS credentials type manages access to a Java Message Service (JMS). This credential type is available for Discovery and Orchestration.

These fields are available in the Credentials form for JMS.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a unique and descriptive name for this credential.</td>
</tr>
<tr>
<td>Active</td>
<td>Enable or disable these credentials for use.</td>
</tr>
<tr>
<td>User name</td>
<td>Enter the user name to create in the Credentials table. Avoid leading or trailing spaces in user names. A warning appears if the platform detects leading or trailing spaces in the user name. For CIM discovery, the user must have the admin role.</td>
</tr>
<tr>
<td>Password</td>
<td>Enter the password.</td>
</tr>
<tr>
<td>Credential ID</td>
<td>Enter the unique key configured for external credentials in the JAR file uploaded to the MID Server for an external credential system. The Credential ID field has a limit of 40 characters. This field is only visible when the External credential store check box is selected.</td>
</tr>
<tr>
<td>Credential alias</td>
<td>Allow workflow creators to assign individual credentials to any activity in an Orchestration workflow or assign different credentials to each occurrence of the same activity type in an Orchestration workflow. To use the credential for discovering CIs not belonging to this CI type using Service Mapping and Discovery patterns, enter the table name for the CI type to which the CI belongs, for example cmdb_ci_apache_web_server. For more information, see Change credentials to non-default.</td>
</tr>
<tr>
<td>External credential store</td>
<td>Select this check box to use an external credential storage system. When you select this option the User name and Password fields are replaced with the Credential ID field. External credential storage is only available when the External Credential Storage plugin in activated.</td>
</tr>
</tbody>
</table>

**Note:** Currently, the only supported external storage system is CyberArk.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applies to</td>
<td>Select whether to apply these credentials to All MID servers in your network, or to one or more Specific MID servers. Specify the MID Servers that should use these credentials in the MID servers field.</td>
</tr>
<tr>
<td>MID servers</td>
<td>Select one or more MID Servers from the list of available MID Servers. The credentials configured in this record are available to the MID Servers in this list. This field is available only when you select Specific MID servers from the Applies to field.</td>
</tr>
<tr>
<td>Order</td>
<td>Enter the order (sequence) in which the platform tries this credential as it attempts to log on to devices. The smaller the number, the higher in the list this credential appears. Establish credential order when using large numbers of credentials or when security locks out users after three failed login attempts. If all the credentials have the same order number (or none), the instance tries the credentials in a random order.</td>
</tr>
</tbody>
</table>

**OAuth 2.0 credentials**

OAuth 2.0 credentials enable ServiceNow to obtain access to user accounts on an HTTP service. These fields are available in the Credentials form for OAuth 2.0.

<table>
<thead>
<tr>
<th>Field</th>
<th>Input value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a unique and descriptive name for this credential. For example, you might call it OAuth2 credential.</td>
</tr>
<tr>
<td>Active</td>
<td>Specify whether this credential is active.</td>
</tr>
<tr>
<td>OAuth Entity Profile</td>
<td>An OAuth profile is a combination of a grant type and at least one scope.</td>
</tr>
<tr>
<td>Applies to</td>
<td>Specify whether the credential is for all MID Servers, or specific MID servers. If specific, add the MID servers as necessary.</td>
</tr>
<tr>
<td>Order</td>
<td>Enter the order (sequence) in which the platform tries this credential as it attempts to log on to devices. The smaller the number, the higher in the list this credential appears. Establish credential order when using large numbers of credentials or when security locks out users after three failed login attempts. If all the credentials have the same order number (or none), the instance tries the credentials in a random order.</td>
</tr>
</tbody>
</table>
### SAP credentials

The SAP credential type manages access to SAP JCo systems. This credential type is available for Discovery and Orchestration.

These fields are available in the Credentials form for SAP type credentials.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a unique and descriptive name for this credential.</td>
</tr>
<tr>
<td>Active</td>
<td>Enable or disable these credentials for use.</td>
</tr>
<tr>
<td>User name</td>
<td>Enter the user name to create in the Credentials table. Avoid leading or trailing spaces in user names. A warning appears if the platform detects leading or trailing spaces in the user name. For CIM discovery, the user must have the admin role.</td>
</tr>
<tr>
<td>Password</td>
<td>Enter the password.</td>
</tr>
<tr>
<td>Credential ID</td>
<td>Enter the unique key configured for external credentials in the JAR file uploaded to the MID Server for an external credential system. The Credential ID field has a limit of 40 characters. This field is only visible when the External credential store check box is selected.</td>
</tr>
<tr>
<td>Credential alias</td>
<td>Allow workflow creators to assign individual credentials to any activity in an Orchestration workflow or assign different credentials to each occurrence of the same activity type in an Orchestration workflow. To use the credential for discovering CIs not belonging to this CI type using Service Mapping and Discovery patterns, enter the table name for the CI type to which the CI belongs, for example <code>cmdb_ci_apache_web_server</code>. For more information, see Change credentials to non-default.</td>
</tr>
<tr>
<td>External credential store</td>
<td>Select this check box to use an external credential storage system. When you select this option the User name and Password fields are replaced with the Credential ID field. External credential storage is only available when the External Credential Storage plugin in activated.</td>
</tr>
</tbody>
</table>

**Note:** Currently, the only supported external storage system is CyberArk.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applies to</td>
<td>Select whether to apply these credentials to All MID servers in your network, or to one or more Specific MID servers. Specify the MID Servers that should use these credentials in the MID servers field.</td>
</tr>
<tr>
<td>MID servers</td>
<td>Select one or more MID Servers from the list of available MID Servers. The credentials configured in this record are available to the MID Servers in this list. This field is available only when you select Specific MID servers from the Applies to field.</td>
</tr>
<tr>
<td>Order</td>
<td>Enter the order (sequence) in which the platform tries this credential as it attempts to log on to devices. The smaller the number, the higher in the list this credential appears. Establish credential order when using large numbers of credentials or when security locks out users after three failed login attempts. If all the credentials have the same order number (or none), the instance tries the credentials in a random order.</td>
</tr>
</tbody>
</table>

**SNMP credentials**

Discovery explores many kinds of devices (switches, routers, printers, etc.) using the SNMP protocol. Credentials for SNMP do not include a user name, just a password, called the community string.

The default read-only community string for many SNMP devices is public, and Discovery will try that automatically. Enter the appropriate SNMP credentials if they differ from the public community string.

Discovering SNMP uses all community strings that are configured. This behavior does not apply to discovering SNMPv3.

The default Orchestration activity SNMP Query returns the object identifier (OID) of a device and requires SNMP credentials.

**SNMP community credentials**

The SNMP Community credential type manages access to discover many kinds of devices (switches, routers, printers, etc.) using the SNMP protocol. This credential type is available for Discovery, Service Mapping, and Orchestration.

Credentials for SNMP do not include a user name, just a password (the community string). The default read-only community string for many SNMP devices is public, and the system will try that automatically. Enter the appropriate SNMP credentials if they differ from the public community string.

These fields are available in the Credentials form for SNMP community.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a unique and descriptive name for this credential.</td>
</tr>
<tr>
<td>Active</td>
<td>Enable or disable these credentials for use.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>User name</td>
<td>Enter the user name to create in the Credentials table. Avoid leading or trailing spaces in user names. A warning appears if the platform detects leading or trailing spaces in the user name. For CIM discovery, the user must have the admin role.</td>
</tr>
<tr>
<td>Password</td>
<td>Enter the password.</td>
</tr>
<tr>
<td>Credential ID</td>
<td>Enter the unique key configured for external credentials in the JAR file uploaded to the MID Server for an external credential system. The Credential ID field has a limit of 40 characters. This field is only visible when the External credential store check box is selected.</td>
</tr>
<tr>
<td>Credential alias</td>
<td>Allow workflow creators to assign individual credentials to any activity in an Orchestration workflow or assign different credentials to each occurrence of the same activity type in an Orchestration workflow. To use the credential for discovering CIs not belonging to this CI type using Service Mapping and Discovery patterns, enter the table name for the CI type to which the CI belongs, for example cmdb_ci_apache_web_server. For more information, see Change credentials to non-default.</td>
</tr>
<tr>
<td>External credential store</td>
<td>Select this check box to use an external credential storage system. When you select this option the User name and Password fields are replaced with the Credential ID field. External credential storage is only available when the External Credential Storage plugin in activated. Note: Currently, the only supported external storage system is CyberArk.</td>
</tr>
<tr>
<td>Applies to</td>
<td>Select whether to apply these credentials to All MID servers in your network, or to one or more Specific MID servers. Specify the MID Servers that should use these credentials in the MID servers field.</td>
</tr>
<tr>
<td>MID servers</td>
<td>Select one or more MID Servers from the list of available MID Servers. The credentials configured in this record are available to the MID Servers in this list. This field is available only when you select Specific MID servers from the Applies to field.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Order</td>
<td>Enter the order (sequence) in which the platform tries this credential as it attempts to log on to devices. The smaller the number, the higher in the list this credential appears. Establish credential order when using large numbers of credentials or when security locks out users after three failed login attempts. If all the credentials have the same order number (or none), the instance tries the credentials in a random order.</td>
</tr>
</tbody>
</table>

**SNMPv3 credentials**

SNMP credentials accept a privacy protocol and an additional privacy key and are available for Discovery and Orchestration.

Discovering SNMP uses all community strings that are configured. This behavior does not apply to discovering SNMPv3. These fields are available in the Credentials form for SNMPv3.

### Table 365: SNMP v3 form

<table>
<thead>
<tr>
<th>Field</th>
<th>Input value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Unique and descriptive name for this credential. For example, you might call it SNMP Community Atlanta.</td>
</tr>
<tr>
<td>Active</td>
<td>Enable or disable these credentials for use.</td>
</tr>
<tr>
<td>Applies to</td>
<td>Select whether to apply these credentials to All MID servers in your network, or to one or more Specific MID servers. Specify the MID Servers that should use these credentials in the MID servers field.</td>
</tr>
<tr>
<td>MID servers</td>
<td>Select one or more MID Servers from the list of available MID Servers. The credentials configured in this record are available to the MID Servers in this list. This field is available only when you select Specific MID servers from the Applies to field.</td>
</tr>
<tr>
<td>Order</td>
<td>Enter the order (sequence) in which the platform tries this credential as it attempts to log on to devices. The smaller the number, the higher in the list this credential appears. Establish credential order when using large numbers of credentials or when security locks out users after three failed login attempts. If all the credentials have the same order number (or none), the instance tries the credentials in a random order.</td>
</tr>
<tr>
<td>User name</td>
<td>Enter the SNMP user name. Avoid leading or trailing spaces in user names. A warning appears if the platform detects leading or trailing spaces in the user name.</td>
</tr>
<tr>
<td>Field</td>
<td>Input value</td>
</tr>
<tr>
<td>----------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Authentication protocol</td>
<td>Select the authentication type to use for this credential. The choices are MD5 and SHA.</td>
</tr>
<tr>
<td>Authentication Key</td>
<td>Enter the authentication key to use for this credential.</td>
</tr>
<tr>
<td>Privacy protocol</td>
<td>Select the encryption protocol for this credential. The choices are: 3DES, AES128, AES192, AES256, DES.</td>
</tr>
<tr>
<td>Privacy key</td>
<td>Enter the key associated with the selected privacy protocol.</td>
</tr>
<tr>
<td>Credential ID</td>
<td>Enter the unique key configured for external credentials in the JAR file uploaded to the MID Server for an external credential system. The Credential ID field has a limit of 40 characters. This field is only visible when the External credential store check box is selected.</td>
</tr>
<tr>
<td>Credential alias</td>
<td>Allow workflow creators to assign individual credentials to any activity in an Orchestration workflow or assign different credentials to each occurrence of the same activity type in an Orchestration workflow.</td>
</tr>
<tr>
<td>External credential store</td>
<td>Select this check box to use an external credential storage system. When you select this option the User name and Password fields are replaced with the Credential ID field. External credential storage is only available when the External Credential Storage plugin is activated.</td>
</tr>
</tbody>
</table>

**SSH credentials**

Discovery and Orchestration explore UNIX and Linux devices by using SSH credentials to execute commands over Secure Shell (SSH). SSH commands must run with root privileges, either with root credentials or through the use of sudo.

**Privileged commands**

The platform provides default privileged commands for the MID Server to use and the ability to add additional commands to the system. For details about using sudo and other privileged commands, see *MID Server privileged commands* on page 1678.
Commands that require root privileges for Discovery and Orchestration

These examples assume that the user name is Disco. Substitute the actual user name and ensure that the paths for the commands match the paths on the system.

**Note:** Sudo commands do not work with private key credentials, because there is no password to supply to the sudo command. A solution is to add the NOPASSWD option to the sudo configuration. For example, you might enter: disco ALL=(root) NOPASSWD:/usr/sbin/dmidecode,/usr/sbin/lsof,/sbin/ifconfig.

Table 366: UNIX and Linux commands requiring root privileges

<table>
<thead>
<tr>
<th>Command</th>
<th>Platform</th>
<th>Purpose</th>
<th>/etc/sudoers line example</th>
<th>Used by</th>
</tr>
</thead>
<tbody>
<tr>
<td>adb</td>
<td>HP-UX</td>
<td>Gathers CPU speed and memory.</td>
<td>Disco ALL=(root) /usr/bin/adb</td>
<td>Discovery</td>
</tr>
<tr>
<td>chage</td>
<td>All Linux and UNIX versions</td>
<td>Changes the number of days between password changes and the date of the last password change.</td>
<td>Disco ALL=(root) /usr/bin/chage</td>
<td>Orchestration</td>
</tr>
<tr>
<td>chpasswd</td>
<td>All Linux and UNIX versions</td>
<td>Changes user passwords.</td>
<td>Disco ALL=(root) /etc/chpasswd</td>
<td>Orchestration</td>
</tr>
<tr>
<td>dmidecode</td>
<td>All Linux</td>
<td>Gathers several pieces of information about the hardware, including the serial number embedded within the motherboard.</td>
<td>Disco ALL=(root) /sbin/dmidecode</td>
<td>Discovery</td>
</tr>
<tr>
<td>dmsetup</td>
<td>Linux and Solaris</td>
<td>Examines a low level volume.</td>
<td>§Disco ALL=(root) /usr/bin/ dmsetup table * §Disco ALL=(root) /usr/bin/ dmsetup ls</td>
<td>Discovery</td>
</tr>
<tr>
<td>fcinfo</td>
<td>Solaris</td>
<td>Gets WWPNs for ports.</td>
<td>$(sudo:fcinfo remote-port -sl -p $port)</td>
<td>Discovery</td>
</tr>
<tr>
<td>Command</td>
<td>Platform</td>
<td>Purpose</td>
<td>/etc/sudoers line example</td>
<td>Used by</td>
</tr>
<tr>
<td>---------</td>
<td>----------</td>
<td>---------</td>
<td>--------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>fdisk</td>
<td>All Linux</td>
<td>Gathers the disks and size information on the system.</td>
<td>Disco ALL=(root) /usr/bin/fdisk -l</td>
<td>Discovery</td>
</tr>
<tr>
<td>iscsiadm</td>
<td>Solaris</td>
<td>Gets iSCSI IQNs.</td>
<td>${sudo:iscsiadm list target -S}</td>
<td>Discovery</td>
</tr>
<tr>
<td>lsof</td>
<td>All UNIX versions</td>
<td>Determines the relationship between processes and the connections being made to the system.</td>
<td>Disco ALL=(root) /sbin/lsof</td>
<td>Discovery</td>
</tr>
<tr>
<td>multipath</td>
<td>All Linux</td>
<td>Gathers device mappings for MPIO.</td>
<td>Disco ALL=(root) /usr/bin/multipath -ll</td>
<td>Discovery</td>
</tr>
<tr>
<td>oratab</td>
<td>All Unix versions</td>
<td>Grants read access to the oratab file for locating the Oracle Home and pfile.</td>
<td>N/A</td>
<td>Discovery</td>
</tr>
<tr>
<td>prtvtoc</td>
<td>Solaris</td>
<td>Reports information about disk partitions.</td>
<td>Disco ALL=(root) /usr/bin/prtvtoc</td>
<td>Discovery</td>
</tr>
<tr>
<td>/usr/bin/ps</td>
<td>Solaris</td>
<td>Lists running process. As an alternative to running with root access, add a proc_owner role.</td>
<td>Disco ALL=(root) /usr/bin/ps</td>
<td>Discovery</td>
</tr>
<tr>
<td>Command</td>
<td>Platform</td>
<td>Purpose</td>
<td>/etc/sudoers line example</td>
<td>Used by</td>
</tr>
<tr>
<td>---------------</td>
<td>----------</td>
<td>--------------------------------------------------------------------------</td>
<td>---------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>/usr/ucb/ps</td>
<td>Solaris</td>
<td>Lists running process. As an alternative to running with root access, add a proc_owner role. The use of the /usr/ucb/ps command is deprecated as of Solaris 11. Because Discovery and Orchestration require the use of this command for all Solaris versions, you must install the ucb utility manually on Solaris 11 systems. For instructions, see KB0564262.</td>
<td>Disco ALL=(root) /usr/ucb/ps</td>
<td>Discovery</td>
</tr>
</tbody>
</table>

For a list of privileged commands that you need for Discovery and Service Mapping, see *Service Mapping commands requiring a privileged user* for a list of the commands that require elevated rights to discover and map Unix-based hosts in your organization.

**Granting root privileges**

Use either of these approaches to allow users to run SSH commands with root privileges:

- Give root credentials. These are obviously the most powerful credentials, but may not be desirable from a security perspective. If Discovery or Orchestration have the root credentials to any UNIX or Linux system, no further configuration is required.

- Give other credentials for Discovery or Orchestration, but grant the user in those credentials the right to execute certain commands with root privileges, using *sudo*. This is a secure way to grant limited privileges. Discovery or Orchestration use sudo on any probe that has the must_sudo parameter set to true (it defaults to false). However, each system must be configured to allow sudo to work. This is done by editing the /etc/sudoers file using the visudo command.

**Access Requirements for Non-Root Credentials**

If you do not provide Discovery with root access credentials, you must provide credentials with the following access requirements.
<table>
<thead>
<tr>
<th>Application</th>
<th>File or Directory</th>
<th>Access Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apache</td>
<td>httpd.conf</td>
<td>Read</td>
</tr>
<tr>
<td>Hbase</td>
<td>hbase-site.xml</td>
<td>Read</td>
</tr>
<tr>
<td>JBoss</td>
<td>jboss-service.xml</td>
<td>Read</td>
</tr>
<tr>
<td></td>
<td>JBoss home directory</td>
<td>Read</td>
</tr>
<tr>
<td></td>
<td>web.xml</td>
<td>Read</td>
</tr>
<tr>
<td>MySQL</td>
<td>my.cnf</td>
<td>Read</td>
</tr>
<tr>
<td>NGINX</td>
<td>nginx.conf</td>
<td>Read</td>
</tr>
<tr>
<td>Oracle</td>
<td>oratab</td>
<td>Read</td>
</tr>
<tr>
<td></td>
<td>Associated (s) pfiles</td>
<td>Read</td>
</tr>
<tr>
<td>Oracle Listener</td>
<td>lsnrctl</td>
<td>Execute</td>
</tr>
<tr>
<td></td>
<td>listener.ora</td>
<td>Read</td>
</tr>
<tr>
<td>Tomcat</td>
<td>catalina.jar</td>
<td>Read</td>
</tr>
<tr>
<td></td>
<td>server.xml</td>
<td>Read</td>
</tr>
<tr>
<td></td>
<td>web.xml</td>
<td>Read</td>
</tr>
<tr>
<td>Unix</td>
<td>/etc/*release</td>
<td>Read</td>
</tr>
<tr>
<td></td>
<td>/etc/bashrc</td>
<td>Read</td>
</tr>
<tr>
<td></td>
<td>/etc/profile</td>
<td>Read</td>
</tr>
<tr>
<td></td>
<td>/proc/cpuinfo</td>
<td>Read</td>
</tr>
<tr>
<td></td>
<td>/proc/vmware/sched/ncpus</td>
<td>Read</td>
</tr>
<tr>
<td></td>
<td>/var/log/dmesg</td>
<td>Read</td>
</tr>
<tr>
<td></td>
<td>APD directory</td>
<td>Read</td>
</tr>
<tr>
<td>WebSphere</td>
<td>cell.xml</td>
<td>Read</td>
</tr>
<tr>
<td></td>
<td>server.xml</td>
<td>Read</td>
</tr>
<tr>
<td></td>
<td>serverindex.xml</td>
<td>Read</td>
</tr>
</tbody>
</table>

**SSH credential type**

These fields are available in the SSH credentials form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a unique and descriptive name for this credential.</td>
</tr>
<tr>
<td>Active</td>
<td>Enable or disable these credentials for use.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>User name</td>
<td>Enter the user name to create in the Credentials table. Avoid leading or trailing spaces in user names. A warning appears if the platform detects leading or trailing spaces in the user name. For CIM discovery, the user must have the admin role.</td>
</tr>
<tr>
<td>Password</td>
<td>Enter the password.</td>
</tr>
<tr>
<td>Credential ID</td>
<td>Enter the unique key configured for external credentials in the JAR file uploaded to the MID Server for an external credential system. The Credential ID field has a limit of 40 characters. This field is only visible when the External credential store check box is selected.</td>
</tr>
<tr>
<td>Credential alias</td>
<td>Allow workflow creators to assign individual credentials to any activity in an Orchestration workflow or assign different credentials to each occurrence of the same activity type in an Orchestration workflow. To use the credential for discovering CIs not belonging to this CI type using Service Mapping and Discovery patterns, enter the table name for the CI type to which the CI belongs, for example cmdb_ci_apache_web_server. For more information, see Change credentials to non-default.</td>
</tr>
<tr>
<td>External credential store</td>
<td>Select this check box to use an external credential storage system. When you select this option the User name and Password fields are replaced with the Credential ID field. External credential storage is only available when the External Credential Storage plugin is activated. Note: Currently, the only supported external storage system is CyberArk.</td>
</tr>
<tr>
<td>Applies to</td>
<td>Select whether to apply these credentials to All MID servers in your network, or to one or more Specific MID servers. Specify the MID Servers that should use these credentials in the MID servers field.</td>
</tr>
<tr>
<td>MID servers</td>
<td>Select one or more MID Servers from the list of available MID Servers. The credentials configured in this record are available to the MID Servers in this list. This field is available only when you select Specific MID servers from the Applies to field.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Order</td>
<td>Enter the order (sequence) in which the platform tries this credential as it attempts to log on to devices. The smaller the number, the higher in the list this credential appears. Establish credential order when using large numbers of credentials or when security locks out users after three failed login attempts. If all the credentials have the same order number (or none), the instance tries the credentials in a random order.</td>
</tr>
</tbody>
</table>

**SSH private key credential type**

*Note:* SSH private key credentials provide better security than SSH password credentials.

<table>
<thead>
<tr>
<th>Field</th>
<th>Input value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Unique and descriptive name for this credential. For example, you might call it SSH Atlanta.</td>
</tr>
<tr>
<td>Active</td>
<td>Enable or disable these credentials for use.</td>
</tr>
<tr>
<td>User name</td>
<td>Enter a UNIX or Linux user name. Avoid leading or trailing spaces in user names. A warning appears if the platform detects leading or trailing spaces in the user name.</td>
</tr>
<tr>
<td>Password</td>
<td>Enter the UNIX or Linux password. For SSH Private Key type credentials, enter the sudo password if one is required for the user name.</td>
</tr>
<tr>
<td>SSH passphrase</td>
<td>Type a secure SSH passphrase. This field is available only for SSH Private Key credentials.</td>
</tr>
<tr>
<td>Field</td>
<td>Input value</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| **SSH private key**        | Enter a secure, private key that can be used instead of a password for SSH logins. The private key must be entered in the proper format to ensure it is correctly encrypted. The private key must start with the string -----BEGIN. Here is an example of a correctly formatted private key:  

```
-----BEGIN RSA PRIVATE KEY-----
MIIEogIBAAKCAQEAsEK65scPssPSobpDFMpR+Btv3MS4Q7NF8ErAStRZsh3IWz+x...
...7hrxV2dbSug60FahyupGWBGTnXm5PaE2X5WPLuUj94u
-----END RSA PRIVATE KEY-----
```

The Now Platform supports private keys in the PEM format generated by the OpenSSH ssh-keygen utility. To convert PPK keys that were generated by PuTTY:

- Open your private key in PuTTYGen.
- Export it in OpenSSH format from the menu Conversions Export OpenSSH key.
- Save the new OpenSSH key. |
| **Credential alias**       | Allow workflow creators to assign individual credentials to any activity in an Orchestration workflow or assign different credentials to each occurrence of the same activity type in an Orchestration workflow. |
| **External credential store** | Select this check box to use an external credential storage system. When you select this option the User name and Password fields are replaced with the Credential ID field. Currently, the only supported external storage system is CyberArk. |
| **MID servers**            | Select one or more MID Servers from the list of available MID Servers. The credentials configured in this record are available to the MID Servers in this list. This field is available only when you select Specific MID servers from the Applies to field. |
| **Applies to**             | Select whether to apply these credentials to All MID servers in your network, or to one or more Specific MID servers. Specify the MID Servers that should use these credentials in the MID servers field. |
VMware credentials

The VMware credentials type manages access to vCenter credentials. Applications that access VMware cloud resources need access to VMware credentials. For example, the VMware credential type allows Discovery to explore VMware's vCenter running on a Windows machine to discover ESX machines, virtual machines, and resource pools. The VMware Discovery and automation API (vCenter API) now provides the globally unique serial number for computer CIs. CIM credentials are not needed to allow access to each VMware host.

**Note:** Windows credentials are not necessary for vCenter Discovery, when valid VMware credentials are used.

**Important:** Do not use VMware Type credentials for Orchestration activities that perform work on the individual virtual machines cloned by vCenter (for example, restarting a Linux VM). For these activities, the credential Type depends on the operating system of the virtual machine (either SSH or Windows).

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a unique and descriptive name for the VMware credentials.</td>
</tr>
<tr>
<td>Active</td>
<td>Enable or disable these credentials for use.</td>
</tr>
<tr>
<td>User name</td>
<td>Enter the user name you use for your VMware account. Avoid leading or trailing spaces in user names. A warning appears if the platform detects leading or trailing spaces in the user name. The VMware credentials must have the read-only role in vCenter.</td>
</tr>
<tr>
<td>Password</td>
<td>Enter the password for the VMware account.</td>
</tr>
<tr>
<td>MID servers</td>
<td>Select one or more MID Servers from the list of available MID Servers. The credentials configured in this record are available to the MID Servers in this list. This field is available only when you select Specific MID servers from the Applies to field.</td>
</tr>
</tbody>
</table>
### Windows credentials

Windows credentials provide access to Windows computers. This credential type is available for Discovery and Orchestration.

#### Credential requirements

Discovery and Orchestration have the following requirements for Windows credentials:

- Install a MID Server on a Windows host as a service.
- Add Windows credentials to one of these locations:
  - An entry in the Credentials [windows_credentials] table
  - A MID Server service account to run as a specific Windows user or domain account.

#### Granting proper permissions

To provide sufficient permissions, Windows credentials must be one of the following:

- A domain user with local administrator access on the target Windows hosts.
- A local account that has administrator privileges and User Access Control (UAC) disabled on the same target host.
- A user who meets the requirements of Windows probes and permissions (Discovery only).
- A user who meets the requirements of the Orchestration activity to be run (Orchestration only).

#### Workgroup computers

To run Powershell commands to discover a Workgroup computer, configure the MID Server credentials for either of these users:

- Built-in administrator account on the Workgroup computer.
- Domain user on the Workgroup computer.

#### Multi-domain configuration

To enable Windows credentials to function across multiple domains, make sure to use the correct name formats and MID Server configuration.
Discovery and Orchestration support Windows domain credentials in both User Principal Name and Down-Level Logon Name user name formats. For example, Domain\UserName or UserName@example.domain.com. You can provide Windows workgroup credentials in the following format: WORKGROUP\UserName.

**Note:** You can also provide a local account by using the .\user name.

These additional actions are required to enable credentials to function across multiple Windows domains.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Additional actions required</th>
</tr>
</thead>
<tbody>
<tr>
<td>MID Server host on the same domain as the Windows target.</td>
<td>None</td>
</tr>
<tr>
<td>MID Server host on a different domain than the Windows target.</td>
<td>Ensure that PowerShell 2.0 or higher is installed on the MID Server host.</td>
</tr>
<tr>
<td>MID Server host on a different domain than the Microsoft SQL Server target.</td>
<td>See <a href="#">MSSQL server discovery</a>.</td>
</tr>
</tbody>
</table>

**Windows credentials type**

These fields are available in the Credentials form for Windows:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a unique and descriptive name for this credential.</td>
</tr>
<tr>
<td>Active</td>
<td>Enable or disable these credentials for use.</td>
</tr>
<tr>
<td>User name</td>
<td>Enter the user name to create in the Credentials table. Avoid leading or trailing spaces in user names. A warning appears if the platform detects leading or trailing spaces in the user name. For CIM discovery, the user must have the admin role.</td>
</tr>
<tr>
<td>Password</td>
<td>Enter the password.</td>
</tr>
<tr>
<td>Credential ID</td>
<td>Enter the unique key configured for external credentials in the JAR file uploaded to the MID Server for an external credential system. The Credential ID field has a limit of 40 characters. This field is only visible when the External credential store check box is selected.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Credential alias</td>
<td>Allow workflow creators to assign individual credentials to any activity in an Orchestration workflow or assign different credentials to each occurrence of the same activity type in an Orchestration workflow. To use the credential for discovering CIs not belonging to this CI type using Service Mapping and Discovery patterns, enter the table name for the CI type to which the CI belongs, for example cmdb_ci_apache_web_server. For more information, see Change credentials to non-default.</td>
</tr>
<tr>
<td>External credential store</td>
<td>Select this check box to use an external credential storage system. When you select this option the User name and Password fields are replaced with the Credential ID field. External credential storage is only available when the External Credential Storage plugin in activated. Note: Currently, the only supported external storage system is CyberArk.</td>
</tr>
<tr>
<td>Applies to</td>
<td>Select whether to apply these credentials to All MID servers in your network, or to one or more Specific MID servers. Specify the MID Servers that should use these credentials in the MID servers field.</td>
</tr>
<tr>
<td>MID servers</td>
<td>Select one or more MID Servers from the list of available MID Servers. The credentials configured in this record are available to the MID Servers in this list. This field is available only when you select Specific MID servers from the Applies to field.</td>
</tr>
<tr>
<td>Order</td>
<td>Enter the order (sequence) in which the platform tries this credential as it attempts to log on to devices. The smaller the number, the higher in the list this credential appears. Establish credential order when using large numbers of credentials or when security locks out users after three failed login attempts. If all the credentials have the same order number (or none), the instance tries the credentials in a random order.</td>
</tr>
</tbody>
</table>

Configure Windows credentials for the MID Server
Configure the MID Server to use either the credentials of its own Windows service or credentials from the Credentials [discovery_credentials] table.

Role required: admin
1. Configure the MID Server to use credentials from the MID Server service account.
a) Set the **MID Server service account** to a user who meets the permission requirements.
b) Verify the user name meets the name format requirements.
c) Fill in the fields on the form, as appropriate.
d) Verify the credentials meet domain requirements.

2. Configure the MID Server use credentials from the Credentials [discovery_credentials] table.
   a) Add individual Windows credentials to the Credentials [windows_credentials] table.
      • Verify each credential meets the permission requirements.
      • Verify each username meets the name format requirements.
      • Verify each credential meets the Windows domain requirements.
   b) [Optional] Configure the MID Server to use Powershell by setting the mid.use_powershell parameter to true. See **MID Server Configuration**.
   c) [Optional] By default, Discovery automatically uses the MID Server service account credentials if all credentials in the Credentials table fail. If you do not want to use the MID Server service credentials as a fall back, set the mid.powershell.local_mid_service_credential_fallback parameter to false.

---

**Credential affinity for Discovery and Orchestration**

Credential affinity is an association between a set of credentials and a device on your network.

When Discovery or Orchestration first attempts to access a device, they try all available credentials until they find the correct ones. After identifying the credentials for a device, Discovery and Orchestration create an affinity between the credentials and the device using the Credential Affinity [dscy_credentials_affinity] table. All subsequent discoveries or Orchestration activities attempt to match the credentials in this table with a device for which an affinity exists. If credentials for a device change, Discovery and Orchestration try all available credentials again until they create a new affinity.

![Credential Affinity diagram](image)

**Figure 270: Credential Affinity diagram**

**Note:** If Orchestration and Discovery are installed, and credential alias is enabled, multiple affinities can exist. In this case, the platform looks up credentials for each affinity and inserts the credential for the affinity with the lowest order into the probe.
Credentials troubleshooting

Review the `<credentials_debug>` section of the ECC queue payload to troubleshoot issues with credentials.

Certain probes support credential debugging, starting with the Istanbul release. Credential debugging inserts a `<credentials_debug>` section in the payload that the MID Server returns to the instance ECC queue. You can view the `<credentials_debug>` section to see detailed information about the credential lookup.

The `<credentials_debug>` section appears in the payload if:

- Credentials fail for WMIRunner probe, PowerShell probe, JMS, or SSHCommand probe.
- You set the credentials_debug parameter to true for the WMIRunner, PowerShell, or SSHCommand probes. If you set the parameter to true, the `<credentials_debug>` section appears even if the credential lookup is successful.

The `<credentials_debug>` section shows:

- Information about the credential search, such as the credential types, tags, and affinities.
- The IP address targeted.
- Information about each credential (in order) that the MID server used, including the type, classification, tag, name, Sys ID, and external credential ID if present.
Figure 271: Sample payload showing invalid credentials

Additional details appear for PowerShell and SSHCommand:

- For the PowerShell parameter:
  - If the local MID Server credentials were used after all the Windows credentials failed, and also if that succeeded.
  - If the credentials were skipped because you are trying to discover the same machine that the MID Server is on, or if the `mid.powershell.use_credentials` parameter is set to true.

- For the SSHCommand:
  - If the credential search was skipped because the target IP is blacklisted.
• If the target IP was added to the blacklist.

**Note:** The MID Server saves IP addresses for failed credential searches in a blacklist in cache memory. This blacklist specifies which devices the MID Server should stop trying to access. By default, the IP addresses stay on the blacklist for five minutes, or until the credentials change or the MID Server is restarted, which clears the cache. You cannot change this time length.

---

**External credential storage**

An instance can store credentials used by Discovery, Orchestration, and Service Mapping in an external credential repository rather than directly in a ServiceNow credentials record.

The instance maintains a unique identifier for each credential, the credential type (such as SSH, SNMP, or Windows), and any credential affinities. The MID Server obtains the credential identifier from the instance, and then uses a customer-provided JAR file to resolve the identifier from the repository into a usable credential. Currently, the ServiceNow® platform supports the use of the CyberArk vault for external credential storage.
External credential storage architecture
**Credential process flow**

The MID Server retrieves credentials from an external store using this process:

1. MID Server downloads credential objects from the ServiceNow Credentials [discovery_credentials] table that contain the corresponding credential ID from the target vault.
2. MID Server checks to see if there are probes to execute from Discovery or Orchestration jobs.
3. MID Server determines if the relevant credentials, such as SSH, Windows or SNMP, are available for the specified probe target. If not, the MID Server uses the Credential Resolver JAR to make a call to the vault to get the actual user name and password. The details about the correct credential object to retrieve from the vault are determined by the Credential Resolver JAR file. Information such as credential ID, target IP address, or credential type are available to the JAR file. If a credential has been retrieved from a previous probe, the credential is cached and is not retrieved again, unless the MID Server is restarted or specifically directed to flush the credential cache.
4. MID Server executes the probe with the appropriate credential.

**Note:** Credential affinity still applies. The mechanism remains the same, since the only real difference from the MID Server's perspective is that the real credential details (user name and password) come from the third party vault.

**External credential storage log**

The MID Server posts log messages about external credential storage.

If the repository encounters an error while attempting to resolve a credentials request, the MID Server posts log messages with this prefix: Problem with client's CredentialResolver:

**Components installed with External Credential Storage**

**Business rule**

The External Credential Storage business rule performs the following tasks when an administrator makes any change to the external credential storage property:

- Changes the view for the Credentials record list and form to the External Storage view. This view enables users to see the Credential ID column in the list.
- Instructs the MID Server to refresh its credentials cache in preparation for a change in the way credentials are obtained.

**Property**

A property called Enable External Credential Storage [com.snc.use_external_credentials] enables or disables the External Credential Storage plugin after it is activated. The property is located in
Activate external credential storage for Discovery and Orchestration

The External Credential Storage plugin is available by request.

Role required: none

Request the plugin through the HI Service Portal.

1. In the HI Service Portal, click Service Requests Activate Plugin.
2. Fill out the form.

<table>
<thead>
<tr>
<th>Target Instance</th>
<th>Instance on which to activate the plugin.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plugin Name</td>
<td>Name of the plugin to activate.</td>
</tr>
<tr>
<td>Specify the date and time you would like this plugin to be enabled</td>
<td>Date and time must be at least 2 business days from the current time.</td>
</tr>
<tr>
<td>Reason/Comments</td>
<td>Provide any information that would be helpful for the ServiceNow personnel activating the plugin. For example, if you need the plugin activated at a specific time instead of during one of the default activation windows.</td>
</tr>
</tbody>
</table>

3. Click Submit.

External credential storage configuration

Configure your instance to obtain credentials from a remote repository.

These procedures assume that you already have an external repository configured with the credentials you want to protect. The credential identifier configured in the ServiceNow instance must be mapped to the actual credential in the repository through the JAR file.

To configure External Credential Storage, complete the following tasks in order.
Create a JAR file to resolve credentials

Create a JAR file to resolve credential identifiers sent from the MID Server into actual credentials from the repository.

Make sure to include all the credential elements that the instance expects, such as the private key.

To create a JAR file to resolve credentials:

1. Use this sample Java file as a template:

```java
package com.snc.discovery;

import java.util.*;
import java.io.*;

/**
 * Basic implementation of a CredentialResolver that uses a properties file.
 */

public class CredentialResolver {
    private static String ENV_VAR = "CREDENTIAL_RESOLVER_FILE";
    private static String DEFAULT_PROP_FILE_PATH = "C:\\dummycredentials.properties";

    // These are the permissible names of arguments passed INTO the resolve() method.
    // the string identifier as configured on the ServiceNow instance...
    public static final String ARG_ID = "id";

    // a dotted-form string IPv4 address (like "10.22.231.12") of the target system...
    public static final String ARG_IP = "ip";

    // the string type (ssh, snmp, etc.) of credential as configured on the instance...
    public static final String ARG_TYPE = "type";

    // the string MID server making the request, as configured on the instance...
    public static final String ARG_MID = "mid";

    // These are the permissible names of values returned FROM the resolve() method.
    // the string user name for the credential, if needed...
    public static final String VAL_USER = "user";

    // the string password for the credential, if needed...
    public static final String VAL_PSWD = "pswd";

    // the string pass phrase for the credential if needed:
    public static final String VAL_PASSPHRASE = "passphrase";

    // the string private key for the credential, if needed...
    public static final String VAL_PKEY = "pkey";

    // the string authentication protocol for the credential, if needed...
```
public static final String VAL_AUTHPROTO = "authprotocol";

// the string authentication key for the credential, if needed...
public static final String VAL_AUTHKEY = "authkey";

// the string privacy protocol for the credential, if needed...
public static final String VAL_PRIVPROTO = "privprotocol";

// the string privacy key for the credential, if needed...
public static final String VAL_PRIVKEY = "privkey";

private Properties fProps;

public CredentialResolver() {
}

private void loadProps() {
    if (fProps == null)
        fProps = new Properties();

    try {
        String propFilePath = System.getenv(ENV_VAR);
        if (propFilePath == null) {
            System.err.println("Environment var "+ENV_VAR+" not found.
Using default file: "+DEFAULT_PROP_FILE_PATH);
            propFilePath = DEFAULT_PROP_FILE_PATH;
        }

        File propFile = new File(propFilePath);
        if (!propFile.exists() || !propFile.canRead()) {
            System.err.println("Can't open "+propFile.getAbsolutePath());
        } else {
            InputStream propsIn = new FileInputStream(propFile);
            fProps.load(propsIn);
        }

        fProps.load(CredentialResolver.class.getClassLoader().getResourceAsStream("dummycredentials.properties"));
    } catch (IOException e) {
        System.err.println("Problem loading credentials file: ");
        e.printStackTrace();
    }
}

/**
 * Resolve a credential.
 */

public Map resolve(Map args) {
    loadProps();
    String id = (String) args.get(ARG_ID);
    String type = (String) args.get(ARG_TYPE);
    String keyPrefix = id+"."+type+"."

    if (id.equalsIgnoreCase("misbehave")
        throw new RuntimeException("I've been a baaaaaaaaad CredentialResolver");

    // the resolved credential is returned in a HashMap...
    Map result = new HashMap();
    result.put(VAL_USER, fProps.get(keyPrefix + VAL_USER));
    result.put(VAL_PSWD, fProps.get(keyPrefix + VAL_PSWD));
    result.put(VAL_PKEY, fProps.get(keyPrefix + VAL_PKEY));
result.put(VAL_PASSPHRASE, fProps.get(keyPrefix + VAL_PASSPHRASE));
result.put(VAL_AUTHPROTO, fProps.get(keyPrefix + VAL_AUTHPROTO));
result.put(VAL_AUTHKEY, fProps.get(keyPrefix + VAL_AUTHKEY));
result.put(VAL_PRIVPROTO, fProps.get(keyPrefix + VAL_PRIVPROTO));
result.put(VAL_PRIVKEY, fProps.get(keyPrefix + VAL_PRIVKEY));

System.err.println("Resolving credential id/type["+id+"/"+type+"] -
  "+result.get(VAL_USER)+"/"+result.get(VAL_PSWD)+"/"+result.get(VAL_PASSPHRASE)+"/"+result.get(VAL_PKEY)+"/"+result.get(VAL_AUTHPROTO)+"/"+result.get(VAL_AUTHKEY)+"/"+result.get(VAL_PRIVPROTO)+"/"+result.get(VAL_PRIVKEY));

return result;
}

/**
 * Return the API version supported by this class.
 */
public String getVersion() {
  return "1.0";
}

public static void main(String[] args) {
  CredentialResolver obj = new CredentialResolver();
  obj.loadProps();

  System.err.println("I spy the following credentials: ");
  for (Object key : obj.fProps.keySet()) {
    System.err.println(key+": "+obj.fProps.get(key));
  }
}

2. Create a properties file to store the external credentials for the script. Use the sample below to add the necessary credentials.

#dummycredentials.properties
#set the environment variable CREDENTIAL_RESOLVER_FILE to the fully qualified path to this file (including file name)
#If the environment variable isn't set, it defaults to C:/Mid Servers/Credentials/dummycredentials.properties
#CREDENTIAL_ID.TYPE.user=
#CREDENTIAL_ID.TYPE.pswd=
#CREDENTIAL_ID.TYPE.pkey=
#CREDENTIAL_ID.TYPE.passphrase=
#CREDENTIAL_ID.snmpv3.authprotocol=
#CREDENTIAL_ID.snmpv3.authkey=
#CREDENTIAL_ID.snmpv3.privprotocol=
#CREDENTIAL_ID.snmpv3.privkey=

#CREDENTIAL_ID is the value in the "Credential ID" field on the instance.
#TYPE is one of
#ssh_password
#ssh_private_key
#snmp
#snmpv3
#vmware
#windows
#mssql
#cim

PublicSnmp.snmp.pswd=public
TestingSnmp.snmp.pswd=Muffins
ExampleDomain.windows.user=EXAMPLEDOMAIN\administrator
ExampleDomain.windows.pswd=Password1

ExampleLinux.ssh_password.user=root
ExampleLinux.ssh_password.pswd=Rootpass123

#For VMWare on 10.0.103.14
ExampleVMWare.vmware.user=administrator
ExampleVMWare.vmware.pswd=vmpass123##$#@

##### Examples ######
# No Authorization with no Privileges
User1.snmpv3.user=user1

# Md5 Authorization with no Privileges
User2.snmpv3.user=user2
User2.snmpv3.authprotocol=md5
User2.snmpv3.authkey=1234567890abcdef

# Sha Authorization with no Privileges
User3.snmpv3.user=user3
User3.snmpv3.authprotocol=sha
User3.snmpv3.authkey=1234567890abcdef

# Authorization with Privileges
User4.snmpv3.user=user4
User4.snmpv3.authprotocol=md5
User4.snmpv3.authkey=1234567890abcdef
User4.snmpv3.privprotocol=aes_128
User4.snmpv3.privkey=1234567890abcdef

Import a JAR file to resolve credentials
Import a JAR file created to resolve credential identifiers sent from the MID Server into actual credentials from the repository.

After you create the JAR file, import it into the instance, where it becomes accessible to the MID Server.

1. After creating the JAR and properties files, copy the properties file to the MID Server.
2. Navigate to MID Server JAR Files.
3. Click New.
4. Complete the following fields:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>A unique and descriptive name for identifying the file in the instance.</td>
</tr>
<tr>
<td>Version</td>
<td>A version number for the file, if one is available.</td>
</tr>
<tr>
<td>Source</td>
<td>Location of the JAR file for reference purposes. Source information is not used by the system.</td>
</tr>
<tr>
<td>Description</td>
<td>Short description of the JAR file and its purpose in the instance.</td>
</tr>
</tbody>
</table>

5. Click the paper clip icon in the banner and attach the JAR file to the record.
Figure 272: Attaching a JAR file

6. Click Submit.
7. Restart the MID Server service.
   The platform makes the JAR file available to any MID Server configured to communicate with the instance.

Configure the credential identifier
Configure the credential identifier in the instance.
Role required: admin
Verify the following items:
• The External Credential Storage plugin must be active.
• The Enable External Credential Storage Discovery property is enabled.

1. Navigate to Discovery Credentials or Orchestration Credentials.
2. Click New.
3. Select a credential type.
4. Select the External credential store check box.
   The User name and Password fields disappear, and the Credential ID field appears.
5. Complete the Credentials form using the fields from the table.
6. Click Submit.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a unique and descriptive name for this credential.</td>
</tr>
<tr>
<td>Active</td>
<td>Enable or disable these credentials for use.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Credential ID               | Enter the unique key configured for external credentials in the JAR file uploaded to the MID Server for an external credential system. This is the ID passed to the Java class in the parameter map:  
  ```java
  public static final String ARG_ID = "id";
  ```  
The MID Server uses this identifier to resolve the actual credentials on the repository.  
  **Note:** This field is only visible when the External credential store check box is selected. |
| Tag                         | Allow workflow creators to assign individual credentials to any activity in an Orchestration workflow or assign different credentials to each occurrence of the same activity type in an Orchestration workflow. |
| External credential store   | Select this check box to use an external credential storage system. When you select this option the User name and Password fields are replaced with the Credential ID field. External credential storage is only available when the *External Credential Storage plugin* in activated.  
  **Note:** Currently, the only supported external storage system is *CyberArk*. |
<p>| Applies to                  | Select whether to apply these credentials to All MID servers in your network, or to one or more Specific MID servers. Specify the MID Servers that should use these credentials in the MID servers field. |
| MID servers                 | Select one or more MID Servers from the list of available MID Servers. The credentials configured in this record are available to the MID Servers in this list. This field is available only when you select Specific MID servers from the Applies to field. |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order</td>
<td>Enter the order (sequence) in which the platform tries this credential as it attempts to log onto devices. The smaller the number, the higher in the list this credential appears. Establish credential order when using large numbers of credentials or when security locks out users after three failed login attempts. If all the credentials have the same order number (or none), Discovery or Orchestration tries the credentials in a random order.</td>
</tr>
</tbody>
</table>

Configure the credential identifier for AWS
Configure your instance to obtain credentials from a remote repository.

Role required: cloud_admin
Verify that the External Credential Storage plugin and Amazon Web Services plugin have been activated and the MID server has been installed.
These procedures assume that you already have an external repository configured with the credentials you want to protect. The credential identifier configured in the ServiceNow instance must be mapped to the actual credential in the repository through the JAR file.

1. Navigate to Amazon AWS Cloud Configuration Accounts.
2. Select the appropriate account.
3. In the AWS Credentials related list, click New and fill in the form, as appropriate.

Table 368: AWS Credentials

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>A unique and descriptive name for this credential. For example, Amazon Web Services.</td>
</tr>
<tr>
<td>Active</td>
<td>Check box to enable or disable the credential.</td>
</tr>
<tr>
<td>AWS Account</td>
<td>Master AWS account to which this credential belongs.</td>
</tr>
<tr>
<td>External credential store</td>
<td>Select this check box to use an external credential storage system. When you select this checkbox, the Access Key ID and the Secret Access Key fields disappear and are replaced by Credential ID and MID servers.</td>
</tr>
<tr>
<td>Credential ID</td>
<td>Enter the Name as stored in CyberArk.</td>
</tr>
<tr>
<td>MID servers</td>
<td>Select one or more MID Servers.</td>
</tr>
</tbody>
</table>

4. Click Submit.
CyberArk credential storage integration

The MID Server integration with the CyberArk vault enables Orchestration, Discovery, and Service Mapping to run without storing any credentials on the instance.

Introduction to CyberArk

CyberArk’s Application Identity Management (AIM) product uses the Privileged Account Security solution to eliminate the need to store application passwords embedded in applications, scripts or configuration files, and allows these highly-sensitive passwords to be centrally stored, logged and managed within the CyberArk vault. This approach enables organizations to comply with internal and regulatory requirements of periodic password replacement and to monitor activities associated with all types of privileged identities, whether on-premise or in the cloud.

The instance maintains a unique identifier for each credential, the credential type (such as SSH, SNMP, or Windows), and any credential affinities. The MID Server obtains the credential identifier, credential type, and IP address from the instance, and then uses the CyberArk vault to resolve these elements into a usable credential.

The CyberArk integration requires the ServiceNow® External Credential Storage plugin, which is available by request.

Installed with CyberArk

- Business rule: The External Credential Storage business rule performs the following tasks when an administrator makes any change to the external credential storage property:
  - Changes the view for the Credentials record list and form to the External Storage view. This view enables users to see the Credential ID column in the list.
  - Instructs the MID Server to refresh its credentials cache in preparation for a change in the way credentials are obtained.

- System property: A property called Enable External Credential Storage [com.snc.use_external_credentials] enables or disables the External Credential Storage plugin after it is activated. This property is located in Discovery Definition Properties and Orchestration MID Server Properties, and is enabled when you activate the plugin.

  **Note:** If you disable external credential storage with the system property, the system automatically sets all the external credentials to inactive in the instance. If you re-enable the feature with this property, the system does not reset the external credential records to active. You must reactivate each credential record manually.

Supported credential types

The CyberArk integration supports these ServiceNow credential types:

- CIM
- JMS
- SNMP Community
- SSH
- SSH Private Key (with key only)
- VMware
Orchestration activities that use these network protocols support the use of credentials stored on a CyberArk vault:

- SOAP (with basic authentication overrides)
- REST (with basic authentication overrides)
- JDBC
- SSH
- PowerShell
- JMS
- SFTP

**Important:** You cannot manage credentials stored on a CyberArk vault and a custom external credential storage system using the same MID Server. To use both types of external storage, install and configure a dedicated MID Server for each. The MID Server must be installed on the same machine as the CyberArk AIM API/client.
CyberArk architecture

ServiceNow CyberArk Integration (Fuji release & prior)

Internal Network

Host A
- MID Server 1
  - Cred Resolver JAR
  - JavaPassword SDK.jar
  - CyberArk AIM Agent

Host B
- MID Server 2
  - Cred Resolver JAR
  - JavaPassword SDK.jar
  - CyberArk AIM Agent

Host X
- CyberArk Vault
  - Safe A
  - Safe B
  - Safe C
  - Cred Obj
  - Cred Obj

IP Devices
- Windows Server
- Linux/Unix Server
- Storage
- Network Devices
- Hypervisor
How the MID Server handles Windows accounts

Credential lookup initially attempts to match the specified credential ID to an existing value in the CyberArk vault Name field. If a match is found, that credential is returned. If no match is found, the credential lookup attempts to find a match using the IP address. If the IP address lookup matches more than one credential, such as Windows and Tomcat on the same server, the lookup fails. To avoid this issue, set the ext.cred.type_specifier parameter in the MID Server config.xml file to true to force CyberArk to return credentials that match both the credential type and the IP address. For example, if an IP address is shared by both Windows and Tomcat, a credential type of Windows returns the Windows credential only.

CyberArk integration configuration

These procedures include both CyberArk and ServiceNow configuration tasks, including references to the appropriate CyberArk documentation.

The credential identifier configured in the ServiceNow instance must be mapped to the credential name in the CyberArk vault. When looking up a credential, the MID Server first tries to find the credential by name, which must be unique, and then by IP address. To identify the credential by IP address, the system looks at the credential type to ensure that there is only one credential of that type at that address. An example of this might be when a Windows server and vCenter are both running on the same IP address. To support strict credential requirements like this in an SSH environment, a MID Server configuration parameter allows you to require that the credential type requested matches the type returned by CyberArk.

To configure your instance to obtain credentials from a CyberArk vault, complete these tasks in the order in which they appear below.

Configure the CyberArk vault and install the AIM API

Configure the CyberArk vault to allow MID Server access and install the CyberArk AIM API on the MID Server machine.

Role required: admin

Before starting this procedure, ensure that the External Credential Storage plugin is activated.

1. Configure the CyberArk vault with the application ID and authentication details that all MID Servers requesting credentials will use.

   For details, refer to the CyberArk Credential Provider and ASCP Implementation Guide.

   a) Ensure that CyberArk is configured to allow the MID Server to access the vault by creating an App-ID in CyberArk called ServiceNow_MID_Server.

   b) Make sure that every credential the MID Server needs is granted access to the ServiceNow_MID_Server App-ID.

   Note: You can override the default ServiceNow_MID_Server App-ID in the MID Server config.xml file using the ext.cred.app_id parameter. If you change the value in this parameter, make sure to configure a matching value in the vault.

2. Install the CyberArk Credential Provider, including the AIM API, on each machine that hosts a MID Server service that is used to access the credential store.

3. Provision CyberArk accounts and set permissions for application access.

   For details, refer to the CyberArk Privileged Account Security Implementation Guide.

   a) In the CyberArk Password Safe, create the privileged accounts required by Discovery, Orchestration, or Service Mapping to access different devices and ensure that these accounts are members of the safes in which the necessary credentials are stored.

   b) Add the Credential Provider and application users as members of the Password Safes where the application passwords are stored.
Import the CyberArk JAR file

Import the CyberArk JavaPasswordSDK.jar file into the instance to make it accessible to the MID Server.

Role required: agent_admin or admin

Before starting this procedure, ensure that CyberArk is configured to allow the MID Server access to credentials. Ensure that the CyberArk AIM API is installed on each server hosting a MID Server that is used to access the vault.

Use this process even if the JavaPasswordSDK.jar file already exists on the MID Server.

1. Navigate to MID Server JAR Files.
2. Click New.
3. Complete the form using the fields in the table.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Unique and descriptive name for identifying the file in the instance.</td>
</tr>
<tr>
<td>Version</td>
<td>Optional version number for the file, if one is available.</td>
</tr>
<tr>
<td>Source</td>
<td>Provider of the JAR file. Source information is not used by the system.</td>
</tr>
<tr>
<td>Description</td>
<td>Optional short description of the JAR file and its purpose in the instance.</td>
</tr>
</tbody>
</table>

4. Attach the JAR file to this record.

The AIM JavaPasswordSDK.jar file comes with the AIM SDK installation files and is typically located on the MID Server in the AIM installation directory at `<install_dir>/CyberArk/ApplicationPasswordSdk`.

5. Click Submit.

6. Restart the MID Server service.

The platform makes the JAR file available to any MID Server configured to communicate with the instance.

Configure the MID Server for CyberArk

Configure the config.xml file to grant the MID Server access to the CyberArk vault.

Role required: admin

Before starting this procedure, import the JavaPasswordSDK.jar file into the instance.

Manually configure the MID Server `config.xml` file with these parameters.

This configuration cannot be done from the instance.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ext.cred.safe_folder</td>
<td>NameOfFolder</td>
<td>Folder to use for all credential lookups. For example, root.</td>
</tr>
<tr>
<td>Parameter</td>
<td>Value</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------</td>
<td>--------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>ext.cred.use_cyberark</td>
<td>true</td>
<td>Boolean parameter indicating that this MID Server is integrated with CyberArk.</td>
</tr>
<tr>
<td>ext.cred.safe_timeout</td>
<td>5 (sec)</td>
<td>Timeout of each credential lookup in the vault, specified in seconds.</td>
</tr>
<tr>
<td>ext.cred.safe_name</td>
<td>NameOfSafe</td>
<td>Default safe name used for all credential lookups. If parameters are in multiple safes, the credential ID may be specified in the format &lt;safeName&gt;:&lt;CredentialID&gt;. When configured like this, the NameOfSafe field is ignored. If all external credentials have their credential IDs specified in this format, then leave out the NameOfSafe field. <strong>Note:</strong> By default the separator character in this format is a colon. To assign any character you want as a separator, add this line to the CredMap.properties file: <code>safe.cred.split.string=&lt;string&gt;</code>.</td>
</tr>
<tr>
<td>ext.cred.app_id</td>
<td>ServiceNow_MID_Server</td>
<td>Specifies the App-ID used to grant permission to the MID Server to access the CyberArk vault. The default value, ServiceNow_MID_Server, must be defined in the CyberArk vault. You can use this parameter to override the default and specify your own App-ID. If you edit the App-ID in this parameter, make sure to configure CyberArk to match.</td>
</tr>
</tbody>
</table>

Table 371: Optional configuration parameters
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
</table>
| ext.cred.type_specifier   | true  | Forcing the lookup to return credentials that match both the CyberArk platform ID and the IP address. For example, if an IP address is shared by both Windows and Tomcat, a credential with a platform ID starting with Win returns the Windows credential only. When this parameter is set to true, CyberArk looks for platform IDs that begin with:  
  • Win: Windows  
  • Unix: SSH  
  • VMWare: VMware |
| ext.cred.check_ssh_type   | false | When set to true, requires that the type of SSH credential returned from CyberArk matches the type of credential requested. For example, if a normal SSH username/password credential is requested and only SSH keys are available, the credential lookup fails. |

Configure CyberArk for SNMPv2 credentials

If your system uses SNMPv2, you can create a special file to map the attribute in a credential to the community string.

Role required: admin

Before starting this procedure, configure the MID Server to have access to the CyberArk vault.

**Note:** If the community string appears in the password field of the CyberArk credential, it is not necessary to perform this procedure.

SNMPv2 is not natively supported in CyberArk. If your organization has created custom SNMPv2 credentials in which the community string does not appear in the password field of the credential, use this procedure to map the attribute to the community string.

1. In a text editor, create a file called CredMap.properties, containing this code:
   ```
   SNMPv2.Community=attribute_name
   ```
2. Save the file to the /agent directory of your MID Server installation.

   On credential lookup, the MID Server attempts to find this attribute for the credential. If the attribute is not found, the MID Server then looks in the password field. If the password field is empty, the credential lookup fails.

Configure the CyberArk credential identifier

Create the unique key that CyberArk can use to identify specific credentials in the external repository.
Role required: admin

Before starting this procedure, ensure that the External Credential Storage plugin is activated, and the com.snc.use_external_credentials system property is set to true.

1. Navigate to Discovery Credentials or Orchestration Credentials.
2. Click New.
3. From the list of credential types, select a type that supports CyberArk external storage.
4. Complete the form using the fields from your credential type.
5. Select the External credential storage check box.
   The User name and Password fields are replaced with the Credential ID field.
6. In the Credential ID field, enter an expression using one of these formats:
   - If all your credentials are in the same safe, configure this safe name in the MID Server config.xml file using the ext.cred.safe_name parameter, and then specify the credential ID by name only, as <credential ID>.
   - To name credentials for a given platform that reside in a specific safe, define the credential ID as <safe>:<credential ID>:<platform ID>.
   - If your credentials are in multiple safes, specify the credential ID in this format: <safe>:<credential ID>.
   - If you want CyberArk to look up the credential by IP address, using an alternate safe, specify the credential ID in this format: <safe>:.
   - If you want CyberArk to look up the credential for an alternate platform ID in the same safe, use this format: ::<platform ID>
   - If you want CyberArk to look up the credential in a configured safe by the IP address rather than the credential ID, leave this field blank. This is the best practice for handling installations in which each server has a unique credential. Without this type of lookup, you must create a credential ID record in your instance for every server in your environment.

   **Note:** The credential ID must match the value in the Name field of the credential in the CyberArk vault. The Credential ID field has a limit of 40 characters.

7. Click Submit.

Configure AWS credentials on a CyberArk vault

Configure your CyberArk vault with the AWS credentials to be retrieved for use by your instance.

Store the credentials as an SSH key on the CyberArk vault. When you configure access to the vault on your instance, the name you give to the SSH key must also be used as the credential ID.

1. In CyberArk, go to Accounts Add SSH Key.
2. Enter the following information:

   **Table 372: CyberArk credentials**

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device Type</td>
<td>Select Cloud Service.</td>
</tr>
<tr>
<td>Platform Name</td>
<td>Select Amazon Web Services - AWS - Access Keys.</td>
</tr>
<tr>
<td>AWS Access Key ID</td>
<td>Enter the AWS Access Key, as provided by AWS.</td>
</tr>
<tr>
<td>Password</td>
<td>Enter the AWS Secret Access Key, as provided by AWS.</td>
</tr>
</tbody>
</table>
3. Choose Save.

If you have not done so already, create a credential identifier on your instance to configure access to the CyberArk vault. For more details, see [Configure access to external credential storage for AWS](#).

**Credential alias for Orchestration activities**

Credential alias gives an administrator more control over the credentials used in Orchestration activities.

This is useful when an activity requires specific credentials to perform a task. You can use a credential tag to assign individual credentials to any activity in an Orchestration workflow or assign different credentials to each occurrence of the same activity type in an Orchestration workflow.

Credential alias interacts with [credential affinity](#) to determine which credentials should be used for an Orchestration activity.

**How credential alias works**

A [business rule](#) called Insert Discovery Affinity (renamed from Insert Credential Affinity in the Geneva release) runs when a record is inserted into the ECC Queue. This rule determines whether a credential affinity exists for the device and identifies the proper credential_id (the sys_id of the record in the Credentials [discovery_credentials] table) to use. When the platform encounters an affinity with a credential alias value defined (credential_alias in the business rule), the business rule determines if the credential referenced by the affinity has the specified alias. If it does, the business rule selects the credential_id of the credential alias and passes that value to the MID Server. If the credential does not have the specified credential alias, any other affinities that exist for the target system will be checked. If no affinity references an appropriately tagged credential, the MID Server iterates through the Credentials [discovery_credentials] table and selects the credential with the appropriate tag. The MID Server then creates a new affinity for this credential.

**Check IP service affinity for Discovery and Orchestration**

You can check the IP Services table for a list of IP addresses that are associated with a protocol.

Role required: admin

The IP Services table maps a port to a protocol. Several mappings are provided by default for commonly used port-protocol combinations, such as port 80 for HTTP, port 22 for SSH, and port 161 for SNMP.

A system property called glide.discovery.ip_service_affinity allows Discovery to remember the last port of the IP address that was discovered. This property is set to false by default.

**Caution**: You should not modify IP services unless your organization uses custom ports.

1. Navigate to Discovery Definition IP Services.
2. Filter the list to find the appropriate IP service.
3. Click the name of the service to go to that IP service page.
4. Click the IP Service Affinities tab for the list of IP addresses associated with that service.
**Figure 273: IP Service Affinities**
Edge Encryption

ServiceNow® Edge Encryption™ encrypts sensitive data on your company premises before sending it over the Internet to your ServiceNow instance (encrypted in flight), where it remains encrypted at rest.

Explore
- Edge Encryption release notes
- Understanding Edge Encryption on page 1081
- Edge Encryption components on page 1084
- Encryption configurations and patterns on page 1087
- Domain separation in Edge Encryption on page 1194

Set up
- Planning for Edge Encryption on page 1095
- Edge Encryption system requirements on page 1096
- Edge Encryption installation on page 1102
- Edge Encryption upgrades on page 1145

Administer
- Key management on page 1085
- Encrypt fields using encryption configurations on page 1102
- Encrypt attachments using standard encryption on page 1158
- Tokenize strings using encryption patterns on page 1161

Use
- Define a custom encryption rule on page 1168
- Schedule an encryption job on page 1156
- Repair or recover order-preserving encrypted data on page 1162

Integrate
- Edge Encryption ODBC driver integration on page 1195
- Edge Encryption MID Server integration on page 1199

Troubleshoot and get help
- Ask or answer questions in the Edge Encryption community
- Edge Encryption diagnostics and performance on page 1199
- Search the HI knowledge base for known error articles
- Contact ServiceNow Support

Understanding Edge Encryption

Edge Encryption is a network encryption system that resides in your network that encrypts and decrypts sensitive data as it travels between your data center and the ServiceNow cloud.

What is Edge Encryption

The Edge Encryption proxy server is a network encryption application that, through encryption in motion, encrypts data within your network before it is sent over the Internet to your instance, where it remains encrypted at rest. When requested, the encrypted data is sent back to the Edge Encryption proxy server, which in turn decrypts your data before serving it to your web browser.

Who uses Edge Encryption

Encrypted data can only be viewed in clear text by a user logged in to the instance through a proxy server in your network. Likewise, Edge Encryption can only be configured and administered by a security_admin user logged in to an instance through a proxy server in your network.

Because the proxy server resides in your network, you own and manage the encryption keys—they are never sent to the instance. As a result, sensitive data is never displayed in clear text to ServiceNow.
**Edge Encryption can encrypt or tokenize your data**

Edge Encryption supports both encryption and tokenization as a means of protecting your sensitive information.

**Encryption configurations**

You can encrypt individual fields using encryption configurations. Edge Encryption supports AES with 128-bit and 256-bit encryption keys. Standard, equality-preserving, and order-preserving encryption types are supported.

In addition to attachments, the following field types can be encrypted:

- String
- Journal
- Journal Input
- URL

If a Journal field marked for encryption is added to the activity stream, all user input to the field is encrypted in the activity stream.

**Note:** Multi-byte characters within supported field types can be encrypted.

**Encryption patterns**

You can use encryption patterns to tokenize strings that match regular patterns such as social security and credit card numbers. While encryption configurations should be the primary method of encryption, use encryption patterns as a supplement to secure sensitive information found outside of encrypted fields.

**Note:** The Edge Encryption proxy server requires a MySQL database in your network only if using order preserving encryption or encryption patterns. Clear text values are stored in the proxy database in your network. For this reason, it is critical that you secure and regularly back up your proxy database. For recommendations, see *Edge Encryption components* on page 1084.
**Edge Encryption on the Now Platform**

Edge Encryption acts as a gateway between your browser and your ServiceNow instance. Traffic from your browser passes through the gateway on its way to the ServiceNow instance. The gateway, in turn, is configured to encrypt outbound data that is marked for encryption. Inbound traffic is decrypted through the gateway, and the end user sees clear text in the browser. The advantage of this implementation from a security control perspective is that the encryption and key management are handled externally from ServiceNow.

Because encryption and tokenization change the nature of your data, Edge Encryption can affect other instance processes. Before using Edge Encryption, carefully consider the impact on your instance by reviewing *Planning for Edge Encryption* on page 1095.
What to know before you begin

Because the proxy server is installed and maintained in your network, Edge Encryption requires network administration and management. Review the network requirements to ensure a smooth implementation.

- [Edge Encryption system requirements](#) on page 1096
- [Sizing your Edge Encryption environment](#) on page 1099
- [Edge Encryption limitations](#) on page 1101
- [Key management](#) on page 1085

Learn more

This podcast offers more information about Edge Encryption.

Edge Encryption components

Edge Encryption is comprised of the Edge Encryption proxy server that runs on a server in your network, and the Edge Encryption plugin that must be installed on your ServiceNow instance. If using order-preserving encryption types or encryption patterns, a proxy database must also be installed in your network.

Proxy application

When going through the Edge Encryption proxy server, the Edge Encryption plugin allows you to specify which fields, patterns, and attachments should be encrypted. You can also manage encryption rules to encrypt specific requests and schedule mass encryption jobs.

Proxy server

The Edge Encryption proxy server uses encryption rules to identify in an HTTP request what, if anything, needs to be encrypted and encrypts it before forwarding the request to the instance. For decryption, the Edge Encryption proxy server looks at the HTTP responses for any encrypted data and decrypts it before sending the response back to the client. In order for this to happen, all HTTP requests and responses must go through the Edge Encryption proxy server. This includes any requests originating from a browser, as well as any SOAP or REST requests.

Proxy database

If using order preserving encryption or encryption patterns, your proxy servers rely on a MySQL database located in your network. All proxy servers in your network must use the same database.

The proxy database contains these tables.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>db_id</td>
<td>Unique database ID</td>
</tr>
<tr>
<td>edge_token_map</td>
<td>Encryption pattern data</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>token_map</td>
<td>Order-preserving encryption data</td>
</tr>
</tbody>
</table>

Back up your proxy database

Because encryption patterns rely on tokenization, clear text values are stored in your proxy database. If the database is lost, clear text values cannot be restored. It is critical that you maintain regular backups. To avoid data loss, back up your proxy database according to ServiceNow recommendations.

- Back up your database every 24 hours.
- Retain MySQL database binary log files for at least two days. After a backup has been restored, use the binary log to regenerate any data lost since the most recent backup. Refer to MySQL database backup best practices for your database version.

Key management

You are responsible for providing and managing the encryption keys used by Edge Encryption.

When obtaining and creating encryption keys to support the encryption types used by Edge Encryption, consider the following:

- Whether to use AES 128-bit or AES 256-bit. You must define a default AES 128-bit encryption key, even if it is not used.
- Whether to use file store, Java KeyStore, or Enterprise Key Management (EKM).
- When to rotate encryption keys.
- When and if to use a mass encryption job to re-encrypt data using the new key.

Before removing a key from the proxy configuration files and the keystore, it is critical that you decrypt all data on the instance that uses the key. You can do this by adding a new encryption key and scheduling a mass key rotation job.

Keystores

Edge Encryption supports the following types of key storage.

**File store**

Keys are stored in a file in a file system that is accessible by the Edge Encryption proxy. Encryption keys stored in a file are not encrypted, so it is your responsibility to protect these files.

**Java KeyStore**

Keys are stored in Java's JCEKS KeyStore. A Java KeyStore is protected by a password, so it is more secure than storing keys in a file in the file store. A single Java KeyStore can store multiple keys, and the keys are identified by a key alias, making it easier to manage multiple keys.

**Enterprise Key Management (EKM)**

Keys are stored and retrieved with the SafeNet KeySecure or Unbound Technology key management systems.

The Edge Encryption proxy ships with the Java JCEKS KeyStore file named keystore.jceks in the keystore directory. This keystore file contains the ServiceNow public key used to validate encryption rules signed by ServiceNow.
**Note:** If using a keystore other than the base system Java JCEKS KeyStore, you must import the ServiceNow public key into your keystore. The public key alias is servicenow.

In addition to the encryption keys, the Java JCEKS KeyStore is used to store the RSA key pair for digitally signing the encryption configuration and encryption rules that are stored in the instance, and the digital certificate that the Edge Encryption proxy uses to establish a secure connection with the browsers and any other clients.

**SafeNet key versioning**

Use SafeNet key versioning to simplify changing keys. Instead of creating a new alias for every new key, SafeNet key versioning keeps the same alias and increments the version.

You must set up key versioning in SafeNet before you can configure SafeNet key versioning on the Edge proxy server.

**Important:** Edge proxies installed before this release support SafeNet keys, but do not support SafeNet key versioning. If you mistakenly use a versioned key on an older proxy, when you upgrade to the London release, the London proxy detects this problem, and to prevent potential data loss the proxy does not start.

You must first schedule a mass key rotation job or a single key rotation job to replace the old SafeNet versioned key with a non-versioned key, and then create a new SafeNet versioned key, if needed. This new versioned key is safe to use with the London proxy, and you can restart the proxy.

**Encryption key configuration**

If using SafeNet versioned keys, the Change Default Keys section of the Encryption Key Configuration form includes new fields for the Key version of the default 128-bit and 256-bit keys. Key version fields are grayed out and cannot be edited.

For procedures, see *Configure encryption keys on the instance* on page 1127.

**Versioned keys**

If using SafeNet versioned keys, when you navigate to **Edge Encryption Configuration Encryption Key Configuration All Keys**, versioned keys include the Key version.
A version number does not appear for the initial entries you make in the Change Default Keys section of the Encryption Key Configuration form. When the proxy server requests a key from SafeNet, the system adds a new line for the alias and adds the Key version.

In the above example, AES128key is listed three times:

- The first listing, with no Key version indicated, is the initial entry.
- The second listing, with 1 in the Key version column, is the first version of the key returned from SafeNet.
- The third listing, with 2 in the Key version column, is the second version of the key returned from SafeNet.
- As other versions of the key are returned from SafeNet, new lines are added to record the Key version now in use.

Encryption configurations and patterns

With Edge Encryption, you can encrypt fields and tokenize strings.

Encryption configurations

You can encrypt individual fields using encryption configurations. Edge Encryption supports AES with 128-bit encryption keys. If the Java Cryptography Extension (JCE) Unlimited Strength Jurisdiction Policy files are installed, Edge Encryption supports 256-bit encryption keys for each encryption type. Edge Encryption supports the following types of encryption configurations.

**Standard encryption**

The encrypted value of a field is different each time the field is encrypted, even when the field value remains the same. Standard encryption is the most
robust form of encryption. Fields using standard encryption cannot be sorted, grouped by, or filtered on.

**Equality-preserving encryption**

The encrypted value of a field is the same when the field value remains the same. Supports equality comparisons and group by operations on a field.

**Note:** When equality-preserving encryption is selected for a field that already contains data, performing a group by action on the field may not group fields with the same value if one is encrypted and the other is not.

**Order-preserving encryption**

Uses tokens and encryption to secure data in your proxy database. Supports equality comparisons, group by operations, and the ability to sort data. The order preserving encryption type is only supported if there is a MySQL database configured for the Edge Encryption proxy server.

**Note:** When using order-preserving encryption and the proxy database is down, updates can be made to fields using order-preserving encryption. However, the sort order will not be correct when trying to sort data based on those fields. Groups also will not work as expected. When the proxy database is again operational, schedule an order token repair job to repair missing tokens.

### Table 374: Encryption types

The following encryption types are listed in decreasing security quality.

<table>
<thead>
<tr>
<th>Encryption type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard AES 256</td>
<td>Fields cannot be filtered, sorted, or compared.</td>
</tr>
<tr>
<td>Standard AES 128</td>
<td>Fields cannot be filtered, sorted, or compared.</td>
</tr>
<tr>
<td>Equality preserving AES 256</td>
<td>Fields can be filtered using equality comparisons.</td>
</tr>
<tr>
<td>Equality preserving AES 128</td>
<td>Fields can be filtered using equality comparisons.</td>
</tr>
<tr>
<td>Order preserving AES 256</td>
<td>Fields can be sorted and equality comparison filtering can be used. Requires the use of a MySQL database in your network.</td>
</tr>
<tr>
<td>Order preserving AES 128</td>
<td>Fields can be sorted and equality comparison filtering can be used. Requires the use of a MySQL database in your network.</td>
</tr>
</tbody>
</table>
Encryption Patterns

You can secure sensitive data found in strings using encryption patterns. Once an encryption pattern is stored and activated, the Edge Encryption proxy server identifies strings that match the pattern in requests. Once located, the clear text string is stored in the proxy database and replaced on the instance with a token. Use encryption patterns to tokenize strings that match regular patterns such as social security and credit card numbers. While we recommend that encryption configurations be the primary method of encryption, use encryption patterns as a supplement to locate and secure sensitive information found outside of encrypted fields.

**Note:** The Edge Encryption proxy server requires a MySQL database in your network only if using order preserving encryption or encryption patterns. Clear text values are stored in the proxy database in your network. For this reason, it is critical that you secure and regularly back up your proxy database. For recommendations, see *Edge Encryption components* on page 1084.

Installed with Edge Encryption

Edge Encryption installs tables to store encryption-related data, system properties to configure default behavior, and the edge_encryption role to administer Edge Encryption.

Tables

Edge Encryption adds the following tables.

**Table 375: Tables for Edge Encryption**

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edge Encryption Configuration [sys_encryption_configuration]</td>
<td>Contains encrypted fields and tables for which attachments are encrypted.</td>
</tr>
<tr>
<td>Edge Encryption Rule [sys_encryption_rule]</td>
<td>Contains a record for each rule. A rule has a name, the condition when it is used, a script, and an order field.</td>
</tr>
<tr>
<td>Edge Encryption Invalid Insert Log [sys_edge_encryption_invalid_insert_log]</td>
<td>Contains log messages created for attempts to save unencrypted data to an encrypted field.</td>
</tr>
<tr>
<td>Edge Encryption Proxy [sys_encryption_proxy]</td>
<td>Contains information about the encryption proxy application.</td>
</tr>
<tr>
<td>Edge Proxy Encryption Type [sys_proxy_encryption_type]</td>
<td>Used for enabling and disabling encryption types on the encryption form.</td>
</tr>
<tr>
<td>Encryption Job Execution [sys_encryption_job_execution]</td>
<td>Supports mass encryption jobs.</td>
</tr>
<tr>
<td>Encryption Job Execution Chunk [sys_encryption_job_execution_chunk]</td>
<td>Supports mass encryption jobs.</td>
</tr>
</tbody>
</table>
| Scheduled Encryption Job  
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>[sysauto_encryption_job]</td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>Lists scheduled jobs for encryption, decryption, key rotation, order token repair, and database recovery.</td>
</tr>
</tbody>
</table>

| Encryption Key Configuration  
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>[sys_encryption_key_configuration]</td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>Lists default encryption keys.</td>
</tr>
</tbody>
</table>

| Encryption Key  
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>[sys_encryption_key]</td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>Lists available keys and key attributes.</td>
</tr>
</tbody>
</table>

| Proxy Encryption Key  
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>[sys_encryption_proxy_key]</td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>Lists proxy encryption keys.</td>
</tr>
</tbody>
</table>

---

**Properties**

Edge Encryption adds the following properties.

**Note:** To open the System Properties [sys_properties] table, enter `sys_properties.list` in the navigation filter.

---

**Table 376: Properties for Edge Encryption**

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.edge.pattern.disallowed.chars</td>
<td>A list of characters that are not allowed in patterns.</td>
</tr>
<tr>
<td></td>
<td>• Type: a string of a comma-separated list of values</td>
</tr>
<tr>
<td></td>
<td>• Location: System Properties [sys_properties] table</td>
</tr>
<tr>
<td>glide.edge.pattern.min.size</td>
<td>The minimum pattern size allowed. Allowing smaller patterns means finding more matches, which increases overhead.</td>
</tr>
<tr>
<td></td>
<td>• Type: number</td>
</tr>
<tr>
<td></td>
<td>• Default value: 5</td>
</tr>
<tr>
<td></td>
<td>• Location: System Properties [sys_properties] table</td>
</tr>
<tr>
<td>sn_edge_encryption.logging.destination</td>
<td>Where messages are logged.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: file</td>
</tr>
<tr>
<td></td>
<td>• Location: System Properties [sys_properties] table</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>sn_edge_encryption.logging.verbosity</td>
<td>The logging level to use.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: info</td>
</tr>
<tr>
<td></td>
<td>• Location: System Properties [sys_properties] table</td>
</tr>
<tr>
<td>sn_edge_encryption.encryption.proxy.buildtag</td>
<td>The proxy version registered with your instance.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Location: System Properties [sys_properties] table</td>
</tr>
<tr>
<td>sn_edge_encryption.cleartext.allowed</td>
<td>When true, allows clear text to be saved in an encrypted field. This happens when a user is accessing the instance without going through the Edge Encryption proxy. When false, the system prevents clear text from being saved in an encrypted field.</td>
</tr>
<tr>
<td></td>
<td>• Type: Boolean</td>
</tr>
<tr>
<td></td>
<td>• Default value: false</td>
</tr>
<tr>
<td></td>
<td>• Location: System Properties [sys_properties] table</td>
</tr>
</tbody>
</table>

Table 377: Roles installed with Edge Encryption

<table>
<thead>
<tr>
<th>Role title</th>
<th>Description</th>
<th>Contains roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>edge_encryption</td>
<td>Edge Encryption proxies log into the instance as a user, with a user name and password. The user must have this role assigned.</td>
<td>None</td>
</tr>
</tbody>
</table>

**CyberArk integration with the Edge proxy server**

Use CyberArk to store passwords in a centralized and secure digital vault to secure passwords that were previously stored in clear text and secured by file access, or that were previously encrypted via a second file.

CyberArk AIM (Application Identity Management) prevents unauthorized access by eliminating hardcoded and visible passwords. AIM stores passwords in a digital vault on an independent hardened server, where the passwords are represented as digital credentials. The AIM clients (the Edge proxy servers) use CyberArk digital credentials and access the independent server to retrieve the secured passwords. No passwords are stored on the Edge proxy servers or in the instance.
**CyberArk digital vault credentials**

You must purchase and configure CyberArk before you can set up CyberArk integration with the Edge proxy server.

To add a credential to CyberArk (which is read by the Edge proxy), set the Platform Name of the credential to Unix via SSH and make sure you either create a Custom credential Name or write down the Auto-generated credential Name. When you configure the Edge proxy to use this credential, the proxy server matches this credential Name to the setting in the proxy.

![Add SSH Key](image)

Each credential entry holds a Password that is being secured, as well as a credential Name used by an application to access that password.

---

**Note:** CyberArk credentials are not encryption keys.

---

**Adding CyberArk during an Edge proxy installation**

The proxy installer includes a new configuration page for a CyberArk integration. This page is optional if you do not want to include CyberArk when installing your proxy with the proxy installer. You can also manually set up and configure CyberArk integration in the configuration file.
The proxy installer also includes a new page for CyberArk protected credentials. This page allows configurations of different properties using a single credential name or multiple credential names. This page is optional if you do not want to include CyberArk when installing your proxy with the proxy installer.
CyberArk password protection

Any password field in the Edge proxy installer that has a CyberArk credential configured in the CyberArk vault and specified on the CyberArk Protected Credentials page of the installer is grayed out and contains the message Protected by CyberArk.
Planning for Edge Encryption

Successful implementation of Edge Encryption requires planning and preparation.

Answer the following questions in the planning stage.

- Which fields are to be encrypted?
- Which encryption types are to be used?
- How many Edge Encryption proxies are needed? See Sizing your Edge Encryption environment on page 1099 for recommendations and considerations.
- If an order preserving encryption type or encryption patterns are to be used, where is the MySQL database located?
- Which key management system is to be used?

System administrators, network administrators, and security team members have different tasks to fulfill for implementing Edge Encryption.

- System administrators need the security-admin role. The system administrator needs to:
  - Download the Edge Encryption proxy application.
  - Set up an Edge Encryption user account for the proxies to use to connect to the instance. The user must be assigned the edge_encryption role.
  - Configure encryption keys, and set the default keys.
  - Configure Edge Encryption on the instance.
  - Schedule encryption jobs.
  - Monitor Edge Encryption.
• Create and edit encryption rules.

• Your network administrator needs to:
  • Install the Edge Encryption proxy application.
  • Know the network addresses for the proxy servers and the proxy database used for order-preserving encryption and encryption patterns.
  • Install the proxy database to be used for order-preserving encryption and encryption patterns.
  • Start and stop the proxy applications.
  • Perform encryption key management.
  • Determine how to map users to encryption proxy applications. This can be done with DNS settings or routing rules, and is specific to each network.
  • Manage multiple proxy servers.
  • Configure load balancer pools and settings.

• Your security administrator must determine the encryption types to be assigned to each field.

Edge Encryption system requirements

You can run the Edge Encryption proxy application on servers or virtual machines that run on Microsoft Windows or Linux operating systems. For optimum performance, ensure that your configuration meets these requirements.

Java requirements

The host machine installing or running the Edge Encryption proxy server must maintain a supported version of Java:

• Java 8 update 121 (8u121)
• Java 8 update 141 (8u141)
• Java 8 update 151 (8u151) or later

Note: Java 8 update 131 (8u131) is not supported.

Note: Before installing the Edge Encryption proxy server, check that the $JAVA_HOME variable is pointing to a supported version of Java for each user that will run the proxy server. For example, if installing the proxy server as a local administrator on Windows, check that the $JAVA_HOME variable is pointing to the correct version of Java system-wide. If installing on Linux, check that each user that will run the proxy server has this variable correctly defined. If a supported version of Java is not found, the Edge Encryption proxy server will not run.
<table>
<thead>
<tr>
<th>Java Version</th>
<th>Enabling AES 256-bit Encryption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Java 8 update 141 (8u141) or earlier</td>
<td>Install the Java Cryptography Extension (JCE) jurisdiction policy files by copying them into the system Java home directory of each Edge Encryption proxy server host. Add these files to the &lt;Java-home-directory&gt;/jre/lib/security folder before performing a scheduled or manual upgrade. To install the AES 256-bit encryption policy files, see Enable AES 256-bit encryption for Java 8 update 141 (8u141) or earlier.</td>
</tr>
<tr>
<td>Java 8 update 151 (8u151) or later</td>
<td>A java.security file is downloaded with the update. You can simply edit the java.security file to enable AES 256-bit encryption. See Enable AES 256-bit encryption for Java 8 update 151 (8u151) or later.</td>
</tr>
</tbody>
</table>

**Note:** Java does not automatically allow unlimited strength keys. You must specifically enable the use of AES 256-bit encryption.

**Proxy server minimum configuration**

A proxy server requires this minimum configuration:

- 4 GB of available RAM per proxy server (6 GB is recommended for most deployments).

  **Note:** The proxy server host requires at least 1 GB of RAM more than the proxy server. The proxy server host needs the extra 1 GB for operating system services. For example, if you configure a proxy server to use 4 GB of RAM, you must install at least 5 GB of RAM on the proxy server host.

  Because the proxy server requires at least 4 GB of memory, 32-bit JREs and 32-bit operating systems are no longer supported starting with the London release.

- 3 or more GHz CPU (4-core CPU preferred for optimum performance).
- Multiple proxy servers behind a load balancer. The number of proxy servers depends on the number of application nodes, the number of simultaneous users, and the number of servers needed for failover. See Sizing your Edge Encryption environment on page 1099 for considerations.
- Ability to run concurrently with other services, depending on the server utilization and resource availability.
- Java 8.
Proxy server supported systems

The following systems are supported:

<table>
<thead>
<tr>
<th>Supported System</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows Server 2012, 2012-R2, and 2016 editions</td>
<td>• Virtual machines or physical hardware</td>
</tr>
<tr>
<td></td>
<td>• 64-bit systems</td>
</tr>
<tr>
<td>Linux</td>
<td>• Virtual machines or physical hardware</td>
</tr>
<tr>
<td></td>
<td>• 64-bit systems</td>
</tr>
<tr>
<td></td>
<td>On 64-bit Linux systems, you must install the</td>
</tr>
<tr>
<td></td>
<td>32-bit GNU C library (glibc). The installation</td>
</tr>
<tr>
<td></td>
<td>command for CentOS is: yum install lib686.</td>
</tr>
</tbody>
</table>

Proxy server connection requirements

The proxy server that runs the Edge Encryption application must be able to communicate with machines in your network. Make sure that the proxy server has these network privileges:

Table 378:

<table>
<thead>
<tr>
<th>Network Privilege</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firewall access</td>
<td>Configure any firewalls between the proxy server and the client devices to allow a connection. If your network uses a DeMilitarized Zone (DMZ) to add an extra layer of security to your Local Area Network (LAN), and if your network security protocols limit port access from within the network to the DMZ, you might have to deploy a proxy server to a machine within the DMZ.</td>
</tr>
<tr>
<td>Network access</td>
<td>Configure each client to enable the proxy server to connect with it. If network security prevents you from configuring new machines that can connect to the clients, install the proxy server on an existing machine with connection privileges.</td>
</tr>
<tr>
<td>Instance access</td>
<td>Ensure that the proxy server has network access to the instance. Make sure that you configure the proxy server network to allow traffic over TCP port 443.</td>
</tr>
<tr>
<td>Network account</td>
<td>Install the proxy server with either a local or domain administrator.</td>
</tr>
</tbody>
</table>
Order-preserving and tokenization database system requirements

Order-preserving encryption and encryption patterns require that you configure an Oracle MySQL database for the Edge Encryption proxy server. Order-preserving encryption allows any comparison operation to be directly applied on encrypted data, without first decrypting the data. Encryption patterns let you replace string patterns with tokens (called tokenization) before they are sent to and stored in the database. Because of the size of the MySQL database, use a dedicated proxy server to run the order-preserving and tokenization database.

The minimum database system requirements include:

Table 379:

<table>
<thead>
<tr>
<th>MySQL Database</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version</td>
<td>MySQL database versions 5.5 to 5.7</td>
</tr>
<tr>
<td>OS</td>
<td>64-bit systems</td>
</tr>
<tr>
<td>CPU</td>
<td>2 or more GHz CPU (4-core CPU preferred for optimum performance)</td>
</tr>
<tr>
<td>RAM</td>
<td>16 GB</td>
</tr>
<tr>
<td>Disk</td>
<td>Storage Area Network (SAN) or local storage (RAID 10 recommended)</td>
</tr>
<tr>
<td>Size</td>
<td>Determined by the number of potential records multiplied by record size. See Calculate the order-preserving and tokenization database size on page 1100.</td>
</tr>
<tr>
<td>Configuration</td>
<td>High availability cluster. If you are unsure of how to configure your MySQL server, contact MySQL for configuration information.</td>
</tr>
</tbody>
</table>

Sizing your Edge Encryption environment

Choosing the number of proxy servers for your environment is an important task. Consider the number of users, redundancy needs, and acceptable latency.

Redundancy

Maintain redundant proxy servers in case of hardware failure. Proxy servers should be located behind a load balancer to provide a functional path for all users if a proxy server is unreachable. At a minimum, ensure that two proxy servers are always available.

Size

Size refers to the number of proxy servers required to avoid additional latency that the encryption of data produces. Depending on use, you may want to reduce the amount of latency by adding additional proxy servers. For example, if regular mass encryptions are run, add additional proxy servers to handle the load, or run the mass encryptions when the user load is light. In addition, the hardware that the proxy server runs on influences performance and latency. Proxy servers running on hardware with faster CPUs, more CPUs, and more RAM have higher throughput than slower, limited systems.
The following guidelines assume that your proxy server is running on at least the minimum hardware requirements. To determine the number of proxy servers:

- Consider setting up one proxy server for every two application nodes on the instance.
- For redundancy, set up a minimum of two proxy servers behind a load balancer.
- Add an extra proxy server for every 500 simultaneous users.
- Depending on the desired redundancy, add additional proxy servers for failover.

For example, for an instance with 2,000 users, you should have at least five proxy servers behind a load balancer. This calculation includes one proxy server for every 500 users, with an extra proxy server for failover. Determine ahead of time when you will approach a threshold of 500 users and place another proxy server in the load balancer pool.

**Load balancers**

To balance requests and improve server response time, distribute proxy servers in a load balancer pool. Configure load balancers to use the "least connections" method. This method connects requests to the proxy server with the fewest active connections, preventing the overloading of a single proxy.

**CPU utilization**

Because data encryption and tokenization are CPU intensive operations, CPU spikes while encrypting data are normal and expected. When CPU utilization is over 80% for several minutes at a time, it likely means that the proxy server has too much work to do. When this happens, latency increases for the period that the CPU utilization is high. If latency persists, adding another proxy server may help decrease the latency.

**Memory**

The proxy server must have a minimum of 4 GB of RAM available (6 GB recommended). Set the proxy server initial and upper bound memory limits to the recommended settings.

**Calculate the order-preserving and tokenization database size**

If using order-preserving encryption or encryption patterns, determine the size of your MySQL database by multiplying the number of potential records by record size.

<table>
<thead>
<tr>
<th>Note:</th>
<th>Use a dedicated machine to run the order-preserving and tokenization database. Do not run the database on the same hardware as the proxy server.</th>
</tr>
</thead>
</table>

1. Determine the potential number of records that could include fields encrypted with order-preserving encryption.
   a) Multiply the number of encryption configurations using order-preserving encryption by the number of records each configuration is applied to.
   b) To allow for growth, multiply the result by three.

2. Multiply the result of step 1 by 1,536.
   1,536 is the average size of a record in bytes.

3. If using encryption patterns, perform steps 1–2 for tokenized records and add the result to the total.

The calculated value is the recommended size in bytes for your order-preserving and tokenization database.
Edge Encryption limitations

Edge Encryption impacts system functions. Carefully evaluate the impact of encrypting a field.

Field type restrictions

Restrictions on encrypting field types.

- The following field types can be encrypted:
  - String
  - Journal
  - Journal Input
  - URL

Choice fields, virtual fields, and any fields other than String and Journal fields cannot be encrypted. See Field types for more information.

- Fields in system tables, except for certain fields in sys_user, cannot be encrypted.
- System fields in tables cannot be encrypted.
- Fields named "number" and fields associated with an auto-numbering scheme cannot be encrypted.
- When a Journal field is encrypted, the Post button is disabled, even if there are multiple Journal fields and only one of those fields is encrypted.
- Encrypted fields are not available in Go to and header filter boxes.
- When encrypting fields used as an index, only order preserving and equality preserving encryption types can be used. Indexed fields cannot be encrypted using the standard encryption type.

Configuration restrictions

Restrictions and behavior of encryption configurations.

- After a field has been added to the Edge Encryption Configuration table, the configuration record cannot be deleted. If you no longer want a field to be encrypted, deactivate the record in the Edge Encryption Configuration table and schedule an encryption job to decrypt the data.
- If a field in a parent table is marked to be encrypted, the field in all inherited tables is also encrypted. For example, if the Short description field in the Task table is encrypted, then the contents of the Short description field in the Incident table are encrypted.
- If a field inherited from a parent table is marked to be encrypted, the field in the parent table cannot be encrypted. For example, if the Short description in the Incident table is marked to be encrypted, then the Short description in the Task table cannot be encrypted. In the example, you can encrypt the Short description in the Problem table.
- When a field with an encryption configuration defined is exported to any format, the output includes encrypted values even when exported through the proxy server. Importing data to a field with an encryption configuration defined is not supported.

Instance restrictions

Impact of using Edge Encryption on the instance.

- Back-end logic cannot process encrypted data. When the instance contains encrypted data, any business rule, back-end script, or back-end feature that relies on evaluating the data in the encrypted field does not run correctly.
Note: Data encrypted with equality preserving encryption will still pass equivalence checks when compared against an identical encrypted value.

- Scripts run on the server cannot change encrypted data.
- Global search is not supported. Because global search attempts to search both encrypted and clear text data, the results may not be as expected.
- Encrypted data cannot be copied and pasted into a record where the field is not encrypted.
- Depending on the type of encryption selected, the user interface functionality for the encrypted fields is reduced. For example, being able to compare, group by, sort, and search may be impacted. Generally, the stronger the encryption selected, the more functionality is reduced.
- Other than file store, Java KeyStore, SafeNet, and Unbound Technology, no third-party software or hardware encryption key management is supported.
- While multiple proxy servers connected to a single instance are supported, encryption proxy cluster management and monitoring are not available. Each proxy must be managed separately.
- System configurations such as workload and the number of encrypted fields can impact the performance of encrypted fields.
- The Edge Encryption proxy server can only connect to a single instance.
- If your instance uses an Oracle database and the string field you are marking to be encrypted is greater than 2925 characters, that field cannot be sorted even when order preserving encryption is selected.
- If your instance uses an Oracle database, Unicode AL32UTF8 is the only supported character set.
- Encrypted values included in emails are encrypted.
- Encrypted data cannot be used in reports.

Edge Encryption installation

You can install an Edge Encryption proxy manually or using the Edge Encryption interactive installer.

Java requirements

The host machine installing or running the Edge Encryption proxy server must maintain a supported version of Java:

- Java 8 update 121 (8u121)
- Java 8 update 141 (8u141)
- Java 8 update 151 (8u151) or later

Note: Java 8 update 131 (8u131) is not supported.

Note: Before installing the Edge Encryption proxy server, check that the $JAVA_HOME variable is pointing to a supported version of Java for each user that will run the proxy server. For example, if installing the proxy server as a local administrator on Windows, check that the $JAVA_HOME variable is pointing to the correct version of Java system-wide. If installing on Linux, check that each user that will run the proxy server has this variable correctly defined. If a supported version of Java is not found, the Edge Encryption proxy server will not run.

Installing the proxy server

Installing Edge Encryption includes these steps.
• Install the Edge Encryption proxy application on a server in your network using the interactive installer
  or the manual installer.
• Generate the RSA key pair for digitally signing encryption configurations and encryption rules.
• Install the Java Cryptography Extension (JCE), if you plan to use AES 256 encryption.
• If you are using a secure SSL connection, obtain a server certificate and import it to the Java KeyStore.
• Set up your keystore and encryption key.
• If order preserving encryption types or encryption patterns are to be used, set up a MySQL database on
  a machine in your network.
• Set the desired properties. Properties are located in the edgeencryption.properties configuration file.

**Accessing the proxy server**

Once installation is complete, point each user's browser to an Edge Encryption proxy using
the URL format: <host>:<port>. Values are determined by the host and port properties in the
edgeencryption.properties file.

As an example with the following values:

<table>
<thead>
<tr>
<th>Property</th>
<th>Example value</th>
</tr>
</thead>
<tbody>
<tr>
<td>edgeencryption.proxy.host</td>
<td>hostname.mycompany.com</td>
</tr>
<tr>
<td>edgeencryption.proxy.http.port</td>
<td>8081</td>
</tr>
</tbody>
</table>

A client will access the proxy server using the following address: http://hostname.mycompany.com:8081/.

*Note:* DNS settings and routing rules may be used. Host and port values are determined by your network administrator.

**Request Edge Encryption**

The Edge Encryption plugin (com.glide.edgeencryption) is available as a separate subscription.

To purchase a subscription, contact your ServiceNow account manager. The account manager can arrange to have the plugin activated on your organization's production and sub-production instances, generally within a few days.

If you do not have an account manager, decide to delay activation after purchase, or want to evaluate the product on a sub-production instance without charge, follow these steps.

Role required: none

1. In the HI Service Portal, click Service Requests Activate Plugin.
2. Fill out the form.

<table>
<thead>
<tr>
<th>Target Instance</th>
<th>Instance on which to activate the plugin.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plugin Name</td>
<td>Name of the plugin to activate.</td>
</tr>
<tr>
<td>Specify the date and time you would like this plugin to be enabled</td>
<td>Date and time must be at least 2 business days from the current time.</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Note:</strong> Plugins are activated in two batches each business day in the Pacific time zone, once in the morning and once in the evening. If the plugin must be activated at a specific time, enter the request in the Reason/Comments.</td>
<td></td>
</tr>
</tbody>
</table>

| Reason/Comments | Provide any information that would be helpful for the ServiceNow personnel activating the plugin. For example, if you need the plugin activated at a specific time instead of during one of the default activation windows. |

3. Click Submit.

**Set up an Edge Encryption user account**

The Edge Encryption proxies connect to the instance as a user to obtain and update encryption configuration information. Create a user account for this purpose and give the `edge_encryption` role to the user.

The Edge Encryption plugin must be installed before you can assign the role.

Role required: admin

1. On your ServiceNow instance, create a user account to be used by the Edge Encryption proxy applications.
2. Assign the `edge_encryption` role to the user.

**Download the Edge Encryption proxy server**

Download the Edge Encryption proxy server application from your instance, and then copy the file to each computer that is to run the Edge Encryption proxy server.

Before starting this procedure, the Edge Encryption plugin must be installed and activated on your instance.

Role required: security_admin

1. Navigate to Encryption Configuration Installation & Downloads Downloads.
2. If using the interactive installer, click Download. If manually installing the proxy server, select the OS version for your proxy server.

**Note:** As the proxy server requires at least 4 GB of memory to run, 32-bit JREs and 32-bit operating systems are no longer supported starting with the London release.

3. Copy the installer to each computer that is to run the Edge Encryption proxy server. If manually installing the Edge Encryption proxy server, copy the ZIP file to each computer that is to run the Edge Encryption proxy server.
After downloading the Edge Encryption installer, Install the Edge Encryption proxy server using the interactive installer on page 1105. If installing manually, Install the Edge Encryption proxy server using the command line installer on page 1119.

Install the Edge Encryption proxy server using the interactive installer

Install the Edge Encryption proxy server on a Windows or Linux computer using the interactive installer.

Important: SafeNet KeySecure keystore files are not supported by the Edge Encryption installer. To use a SafeNet KeySecure keystore, Install the Edge Encryption proxy server using the command line installer on page 1119.

The Edge Encryption plugin must be installed and activated on your instance before you start this procedure. Ensure that the latest version of Java 8 is installed on the machine running the Edge Encryption installer.

The latest version of Java 8 is Java SE 8u171/8u172.

- Java SE 8u171 includes important bug fixes. Oracle strongly recommends that all Java SE 8 users upgrade to this release.
- Java SE 8u172 is a patch-set update, including all of 8u171 plus additional bug fixes.

Role required:

- security_admin on your ServiceNow instance
- local or domain administrator on a Windows host
- service user with full file system access on a Linux host

After installing a new proxy server, you can run the installer again to perform tests to detect issues with an installation or modify current settings. Your options include:

- Install New: Install a new proxy server.
- Verify Installation: Perform tests to detect and fix issues in a previous installation.
- Reinstall Existing: Perform tests to detect and fix issues in a previous installation and view or modify existing settings.

Note: If installing the proxy server on a Linux machine on a privileged port (port 80 or 443), you must run the installer as a root user with full file system access. To restrict file system access after the proxy server is installed, you can use the SetUID feature in the proxy installer. To enable this feature, start the installer as root or sudo root. When prompted by the installer, provide the username and usergroup of an unprivileged user. The proxy server will install with file system privileges of the given user. You can skip this step to continue the default installation with root privileges.

Use the installer to install multiple proxies for your instance on multiple machines, ensuring that the following criteria apply:

- All proxies must have the same encryption keys and the same RSA key pair used to digitally sign encryption configurations and rules.
- The encryption key must be the default key configured on the instance.
- When a proxy database is set up as part of the installation, all proxies must use the same proxy database.

You may need a proxy database for equality-preserving encryption, order-preserving encryption, or tokenization. If you do not use any of these features, you do not need a proxy database.
To use NVDA, an Assistive Technology screen reader designed to read accessibility-enabled Java applications built for keyboard users, see *Configure a Windows 64-bit host to use 32-bit NVDA with Java applications*.

After installing the Edge Encryption proxy server, *Set the proxy server initial memory limit and upper bound memory limit* on page 1129.

**Install the Edge Encryption proxy server (interactive installer)**

Install the Edge Encryption proxy on a Windows or Linux computer.

1.  *Download the Edge Encryption proxy server installer.*
2.  Open the Edge Encryption proxy installer.

   **Note:** If installing on a Windows machine, you must run the installer as Administrator.

   a)  To run the installer as Administrator on a Windows machine, right-click the Command Prompt and select Run as administrator.

   b)  From the command line, navigate to the directory that contains the downloaded .jar file.

   c)  Run the following command: java -jar <file name>.jar.
3. To install a new proxy server, select Install New.
   If a proxy is already installed, you can run the installer to:
• Verify Installation: Perform tests to detect and fix issues in a previous installation.
• Reinstall Existing: Perform tests to detect and fix issues in a previous installation and view or modify existing settings.

4. Configure the Installation Location and Target ServiceNow Instance.
   a) Click Browse to select an installation location or manually enter an installation path.
   b) Enter the URL of the target ServiceNow instance. Include the protocol and port number.
      https://example.servicenow.com:443
   c) Enter the user name and password for a user with the edge_encryption role on the target ServiceNow instance.

5. Click Next.

6. Configure the Connection Settings and Proxy Settings.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proxy Host</td>
<td>Fully qualified domain name of the machine on which you are installing the proxy server.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Click Detect FQDN to look up the machine’s fully qualified domain name and auto-populate the Proxy Host field.</td>
</tr>
<tr>
<td></td>
<td>Along with the port, this property defines the URL used by the client to access the proxy server.</td>
</tr>
<tr>
<td>HTTP Port</td>
<td>Port on the proxy for HTTP communication.</td>
</tr>
<tr>
<td>HTTPS Port</td>
<td>Port on the proxy for HTTPS communication.</td>
</tr>
<tr>
<td>Proxy Name</td>
<td>Name of the proxy and the service. The proxy name must be unique.</td>
</tr>
<tr>
<td>Proxy Poll Interval</td>
<td>Poll interval in seconds. With the default setting, it takes 5 seconds for the proxy to learn of encryption configuration changes. Larger values cause the instance to take longer to detect proxies that have come online.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Changing the default setting of the Proxy Poll Interval can result in detection delays when a proxy comes online.</td>
</tr>
<tr>
<td>Proxy Keep-Alive Ping Interval</td>
<td>Time in seconds between pings issued by the proxy to the instance. Pings are issued periodically to verify connectivity between the proxy and the instance. The default value is 10. The minimum value is 5.</td>
</tr>
</tbody>
</table>

7. Click Install.
The Edge Encryption proxy server installs. The installation may take a few minutes.

**Configure CyberArk properties protection**

Optionally, configure CyberArk properties protection to securely store Edge Encryption passwords in a centralized and secure digital vault.

You must purchase and configure CyberArk AIM (Application Identity Management) before you can configure CyberArk connection parameters and protected credentials for a proxy server. As part of the installation of the AIM client, the JavaPasswordSDK.jar file is installed in the AIM client installation directory. The CyberArk vault is installed on an independent hardened server, and the AIM clients allow secure access to that server.

**Important:** You must install the CyberArk AIM client on every host computer where an Edge proxy is installed.

In the Edge installer, you must specify the location of the JavaPasswordSDK.jar file to set up the CyberArk connection to the Edge proxy. You must also enter other values you defined during the AIM client installation.

Setting up CyberArk password storage is optional. If you do not want to set up CyberArk password storage, click Skip through the CyberArk screens.

1. On the CyberArk Connection page of the Edge Encryption installer, enter the CyberArk connection parameters.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Path to PasswordSDK.jar</td>
<td>The path to the JavaPasswordSDK.jar file installed on the host Windows machine during CyberArk configuration.</td>
</tr>
<tr>
<td>App ID</td>
<td>The App ID entered during CyberArk configuration.</td>
</tr>
<tr>
<td>Safe Name</td>
<td>The Safe Name entered during CyberArk configuration.</td>
</tr>
</tbody>
</table>

2. Click Next.

3. On the CyberArk Protected Credentials page of the installer, enter the credentials to be protected by CyberArk.
   - To use a single credential name for all protected passwords, select the Apply one Credential Name to all Credentials check box, enter the credential name, and click Apply.
   - Enter the credential name for one or more of the following fields. Credential names are the usernames entered for the SSH keys during CyberArk configuration.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edge Encryption User</td>
<td>The CyberArk credential name for an Edge Encryption user.</td>
</tr>
<tr>
<td>Signature Key Keystore</td>
<td>The CyberArk credential name for the signature key keystore.</td>
</tr>
<tr>
<td>Setting</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>HTTPS Cert Keystore</td>
<td>The CyberArk credential name for the HTTPS certification keystore.</td>
</tr>
<tr>
<td>Encryption Key Keystore</td>
<td>The CyberArk credential name for the encryption key keystore.</td>
</tr>
<tr>
<td>Database</td>
<td>The CyberArk credential name for the database keystore.</td>
</tr>
<tr>
<td>SafeNet HTTPS Cert Keystore</td>
<td>The CyberArk credential name for the SafeNet HTTPS certification keystore.</td>
</tr>
<tr>
<td>SafeNet Server</td>
<td>The CyberArk credential name for the SafeNet server.</td>
</tr>
<tr>
<td>Forward Proxy</td>
<td>The CyberArk credential name for the forward proxy.</td>
</tr>
</tbody>
</table>

4. Click Next.

**Configure the signature key**

Configure the signature key after installing the proxy server through the Edge Encryption proxy installer. The signature key signs changes to configurations and properties made by the proxy server. The signature key must be an asymmetric RSA key pair in a JCEKS KeyStore.

**Note:** If installing multiple proxies, each proxy must use the same signature key.

1. On the Signature Key page of the Edge Encryption installer, select the keystore on the host machine to store the signature key.
   - Create New Java KeyStore: Enter the directory location, name, and password for the new keystore.
   - Use Existing Keystore: Enter the keystore file location and password.

2. Click Next.

3. Select or create a signature key.
   - New Key: Create a signature key for this proxy.
   - Use Existing Key: Use an RSA key-pair from the selected keystore.
   - Import Existing Key: Import an RSA key-pair from a different keystore. Browse to the keystore file, enter the password for the keystore, and select the key alias. Provide a new alias for the key.

4. Click Next.

**Configure the HTTPS certificate**

To enable clients to connect to the Edge Encryption proxy server using a secure SSL connection, import the HTTPS certificate to the proxy server.

The Edge Encryption proxy provides the HTTPS certificate to clients trying to connect.

1. On the HTTPS Certificate page of the Edge Encryption installer, select the keystore to store the certificate.
   - Create New Java KeyStore: Enter the directory location, name, and password for the new keystore.
   - Use Existing Keystore: Enter the keystore file location and password.
2. Click Next.
3. Select or import a certificate.
   The key alias is the given alias for the certificate.
   - Use Existing Certificate: Use an existing certificate in the selected keystore.
   - Import from File or KeyStore: Import a certificate from a different keystore or a .cer file. Browse to the keystore or .cer file, enter the password, and select the alias. You must provide a new alias for the certificate.

4. Click Next.

Configure the AES 128-bit encryption key

After you configure the HTTPS certificate through the Edge Encryption proxy installer, configure the AES 128-bit encryption key. Use the encryption key to encrypt your data.

The encryption key is either a plain text file inside the /keys directory or a secret key inside a keystore. If you use a keystore for your AES 128-bit and AES 256-bit encryption keys, they must both use the same keystore.

1. Select the location to store the encryption key.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>File Store</td>
<td>Use a file to store a single encryption key. You can use an existing file in the /keys directory, or you can generate a new file. To generate a new file, enter an alias and click Generate. A file containing an encryption key is created.</td>
</tr>
</tbody>
</table>

**Note:** This choice designates both the storage location and the encryption key. If you select File Store, click Next and go to step 5.

<table>
<thead>
<tr>
<th>Create New Java KeyStore</th>
<th>Create a keystore to store the encryption key.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Java KeyStore File</td>
<td>Store the encryption key in an existing Java KeyStore file.</td>
</tr>
</tbody>
</table>

2. Click Next.
3. Select or create the encryption key.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Key</td>
<td>Create an encryption key and alias. The alias name (key name, key alias) must use lowercase letters and numbers, per Java KeyStore requirements. To find out more about the keytool utility, see the Java SE Documentation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Use Existing Key</th>
<th>Use an existing encryption key in the selected keystore.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Import Existing Key</td>
<td>Import an encryption key from a different keystore.</td>
</tr>
</tbody>
</table>

4. Click Next.
5. Configure the key on the instance according to the requirements defined in your installer.
To configure the key on the instance, navigate to the instance and define a default key. See *Configure encryption keys on the instance* on page 1127. Ensure that the key alias, size, and type match the requirements defined in the installer.
Default Encryption Key

This step requires you to go to your instance and create a default key. Click the links below and follow the instructions. Click 'Next' when you are done setting up the default key on your instance.

- The 'Key alias' must be: aes128
- The 'Key size' must be: 128
- The 'Type' must be: Keystore

Click here for documentation
Click here to go to your default keys

Figure 275: Default key requirements

6. Once the key is configured on the instance, return to the installer and click Next.
Configure the AES 256-bit encryption key

After you configure the AES 128-bit key through the Edge Encryption proxy installer, you can optionally configure an AES 256-bit encryption key to encrypt your data.

The encryption key is either a plain text file inside the /keys directory or a secret key inside a keystore. If you use a keystore for your AES 128-bit and AES 256-bit encryption keys, both keys must use the same keystore. If you do not want to configure an AES 256-bit encryption key, click Skip to continue installing the proxy server.

1. Select the encryption key location.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>File Store</td>
<td>Use a file to store a single encryption key. Use an existing file in the /keys directory or generate a new file. To generate a new file, enter an alias and click Generate. A file containing an encryption key is created.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This choice designates both the storage location and the encryption key. If you select File Store, click Next and go to step 5.</td>
</tr>
</tbody>
</table>

2. Click Next.

3. Select or create the encryption key.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Key</td>
<td>Create an encryption key and alias.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> You must use lowercase letters and numbers for the alias name (key name, key alias), per Java KeyStore requirements. To find out more about the keytool utility, see the Java SE Documentation.</td>
</tr>
</tbody>
</table>

Use Existing Key

Use an existing encryption key in the selected keystore.

Import Existing Key

Import an encryption key from a different keystore.

4. Click Next.

5. If you want to use AES 256-bit encryption, do the following:

<table>
<thead>
<tr>
<th>Option</th>
<th>Choice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Java 8 update 141 or earlier</td>
<td>Install the Java Cryptography Extension (JCE) and overwrite the policy files in the Java home directory. See Enable AES 256-bit encryption for Java 8 update 141 (8u141) or earlier.</td>
</tr>
<tr>
<td>Option</td>
<td>Choice</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Java 8 update 151 or later</td>
<td>Edit the java.security policy file to allow the use of unlimited strength keys. See <em>Enable AES 256-bit encryption for Java 8 update 151 (8u151) or later</em>.</td>
</tr>
</tbody>
</table>

6. To use AES 256-bit encryption, you must also configure the AES 256-bit default encryption key on the instance by navigating to the instance and defining a default key.

See *Configure encryption keys on the instance* on page 1127. Ensure that the key alias, size, and type match the requirements defined in the installer.

7. Once the key is configured on the instance, return to the installer and click Next.

**Configure the Edge Encryption proxy database**

If using order-preserving encryption types or encryption patterns, configure the Edge Encryption proxy database properties.

To use order-preserving encryption types or encryption patterns, a MySQL database running in your network is mandatory. This task connects the proxy to the database, but it does not install or configure the database.

*Note:* If using multiple proxy servers, all proxy servers must use the same proxy database. The values entered in the installer must be the same for all proxy servers.

1. Confirm or change the database URL. This URL is the location of the proxy database.
2. In the Name field, enter the name of the proxy database. The default value is edgeencryption.
3. Enter the username and password for accessing the proxy database.
4. Click Next.

**Launch the Edge Encryption proxy server**

After an Edge Encryption proxy is installed and configured, you can start the proxy from the installer.

1. After configuring keys on the instance and optionally configuring the proxy database, return to the Edge Encryption proxy installer and click Launch.
2. If an issue is detected, or to check the status of your proxy server, you can click Check Status to verify that the proxy is running.
   A message displays the proxy status.
Congratulations!

The Edge Encryption Proxy is ready to launch. If you would like to launch it now, hit the "Launch" button. Your instance through the Proxy is available at:

https://localhost:8082

If you encounter any errors, check to make sure that your setup is correct. If the problem persists, contact ServiceNow support.

Launch

Check Status

Stop Proxy

Successfull launch!

Figure 276: Proxy status
After successfully installing the Edge Encryption proxy server, *Set the proxy server initial memory limit and upper bound memory limit* on page 1129.

**Verify and troubleshoot the Edge Encryption proxy server installation**

After your Edge Encryption proxy is installed, you can verify the installation to locate problems or start and stop the proxy.

1. Open the Edge Encryption proxy installer.
2. Select Verify Installation.
3. Click Proxy Directory and select the proxy directory.
4. Click Run Tests.
   Test results display.
Figure 277: Edge Encryption proxy installation tests

5. Click Next.
If an issue is encountered, you can move through the installer to correct the configuration. If no issues are encountered, the installer jumps to the Launch page. You can check the proxy status, stop the proxy, or start the proxy from the Launch page.

Install the Edge Encryption proxy server using the command line installer

Manually install multiple Edge Encryption proxy servers in your network.

Roles required: security_admin on your ServiceNow instance and local administrator on the host machine.

If order preserving encryption types or encryption patterns are to be used, set up a MySQL database on a machine in your network if not already present.

**Note:** If using Unbound Technology encryption keys with Edge Encryption, install the proxy server using the command line installer on the Unbound client machine. The Edge Encryption proxy server must run on the same machine as the Unbound technology client.

First, set up a single Edge Encryption proxy server. After your first proxy server is successfully running, add additional proxy servers for one instance to ensure an optimal environment. See [Sizing your Edge Encryption environment](on page 1099) to determine the number of additional proxy servers needed.

Install the Edge Encryption proxy server (command line installer)

Install an Edge Encryption proxy on a 64-bit Windows or Linux computer.

Java 8 is required to run the installer.

Install the Edge Encryption proxy server on a machine in your network using the appropriate command for your target machine. If installing the Edge Encryption proxy server on a Windows machine, you must additionally install the proxy server as a Windows service.

When you upgrade the Edge Encryption proxy server, the system backs up the old proxy in the backup.dist-upgrade-<timestamp> directory under the current installation directory. The backup directory is generated during the upgrade process and stores the old proxy information.

When you run an upgrade via the command line, a dist-upgrade.log may be generated in the directory where the command runs. The dist-upgrade.log contains logs for the upgrade process.

In case of a failed upgrade, the system creates a failed-backup.dist-upgrade-<timestamp> directory. In addition, logs/wrapper.log in the original proxy directory may also contain failure information.

1. Create the installation directory.
2. Download the Edge Encryption proxy archive file to the installation directory.
3. Open the terminal and change to the installation directory.

**Note:** If installing on a Windows machine, you must start the Windows Command Prompt with administrator privileges.

4. Run this command for the target machine and change the variables according to your configuration:
   java -jar edgeencryption-<version>-all.jar -m install -n <ProxyName> --instancehost <host> -p <InstancePort> --protocol https

<table>
<thead>
<tr>
<th>Option</th>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>none</td>
<td>version</td>
<td>Version number of the Edge Encryption proxy being used to perform the current operation.</td>
</tr>
<tr>
<td>Option</td>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>-------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>-m</td>
<td>mode</td>
<td>The operation or mode to run in (install or dist-upgrade).</td>
</tr>
<tr>
<td>-n</td>
<td>ProxyName</td>
<td>The name of the encryption proxy instance. Use a unique ProxyName to be able to identify specific proxy instances.</td>
</tr>
<tr>
<td>--instancehost</td>
<td>host</td>
<td>The host name of your ServiceNow instance (for example, mycompany.service-now.com).</td>
</tr>
<tr>
<td>-p</td>
<td>InstancePort</td>
<td>The port of your instance. When the protocol is https, the port is normally 443.</td>
</tr>
<tr>
<td>--protocol</td>
<td>protocol</td>
<td>The protocol used to access your ServiceNow instance (typically https).</td>
</tr>
</tbody>
</table>

**Caution:** Do not copy and paste commands from the browser. Occasionally, copy/paste operations cause unexpected characters to be pasted to the target machine and results in the command being executed incorrectly. It is best to type out the command by hand using documentation as a reference.

To see the help screen, execute this command without arguments: `java -jar edgeencryption-<version>-all.jar`

5. If installing on a Windows machine, install the Edge Encryption proxy as a Windows service.
   a) Optionally change the name of the service. Open the conf/wrapper.conf file on the new proxy and set the following properties:

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>wrapper.ntservice.name</td>
<td>Unique name of the Edge Encryption proxy service.</td>
</tr>
<tr>
<td>wrapper.ntservice.displayname</td>
<td>Edge Encryption proxy service display name.</td>
</tr>
<tr>
<td>wrapper.ntservice.description</td>
<td>Proxy server description.</td>
</tr>
</tbody>
</table>

   If this step is not performed, the Edge Encryption proxy service is installed under the name Edge Encryption.

   b) Save and close the file.

   c) Open the Windows Command Prompt and cd to ServerName_port/bin.

   d) Execute edgeencryption.bat install.
The ProxyName_port directory is created in the current directory. The edgeencryption.properties file is updated with the host, port, and protocol values from the command line.

Create and configure the RSA key pair for the digital signature

Create an RSA key pair that the proxy server can use to create the digital signature for signing changes to the encryption properties and configuration.

To generate and validate the digital signature, an RSA key pair must be generated and stored in the JCEKS Java KeyStore and each proxy must be configured to use this key pair. Generate an encryption key pair using the keytool command.

To use the keytool utility with a proxy installed on SELinux (e.g. CentOS), you must enable loading of shared libraries from the proxy java-installation directory. To do this, run the following command as root.

```bash
chcon -R -t texrel_shlib_t proxy_install_dir/java/jre /lib
```

You must use the Java 1.8 version of the keytool utility. A copy of the utility can be found in proxy_install_dir/java/jre/bin/keytool.

1. Change to the KeyStore directory in the proxy download directory.
2. Change the default password.

   The default password is changeme.

   ```bash
   keytool -keystore keystore.jceks -storetype jceks -storepasswd -new <newpassword>
   ```

3. Create an encryption key pair.

   Note: Do not enter a password for the key when the keytool utility prompts for one.

   Enter this command on a single line.

   ```bash
   keytool -genkeypair -alias <key alias> -keyalg rsa -keystore keystore.jceks
   -storetype jceks -storepass <keystore password> -keysize 2048
   ```

4. Update the encryption proxy property file (edgeencryption.properties).

   a) Change to the <installation directory>/conf/ directory.
   b) Open the edgeencryption.properties file.
   c) Enter the properties for the digital signature. These properties must be the same for all proxies.

5. Save and close the edgeencryption.properties file.

Import and configure the certificate for secure SSL connection

To use a secure SSL connection, import a server certificate and add it to the Java KeyStore.

You must obtain the server certificate before you can add it to the Java KeyStore.

1. Add a server certificate to the Java KeyStore.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you have the RSA private key in the Java Keystore and generated the certificate from that key.</td>
<td>keytool -import -alias keyname -file server.cert -storetype JCEKS -keystore keystore.jceks -storepass pwd</td>
</tr>
<tr>
<td>If you have a PKCS12 (.pfx) file that contains the RSA key and the certificate.</td>
<td>keytool -importkeystore -destkeystore keystore.jceks -deststoretype jceks -srckeystore &lt;PKCS12 filename&gt; -srcstoretype pkcs12</td>
</tr>
</tbody>
</table>

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Make sure that the private key password is the same as the Java KeyStore password.
You can run this command to change the password.

```
keytool -keypasswd -keystore keystore.jceks -alias <key alias>
```

For testing, you can use this command to generate a self-signed certificate.

```
keytool -genkeypair -alias cert -keystore keystore.jceks -storetype jceks -keyalg rsa
```

2. Update the edgeencryption.properties file.
   a) Change to the `<installation directory>/conf/` directory.
   b) Open the edgeencryption.properties file.
   c) Enter the properties for the SSL certificate.

The certificate must be the same for all proxies connecting to the same instance.

3. Save and close the edgeencryption.properties file.

Enable AES 256-bit encryption

256-bit encryption is more secure than 128-bit encryption, and you can optionally configure AES 256-bit encryption on the Edge Encryption proxy server host. How you enable AES 256-bit encryption depends on the Java update installed on each proxy server host.

Edge Encryption supports only AES 128-bit and AES 256-bit keys.

**Note:** Java does not automatically allow unlimited strength keys. You must specifically enable the use of AES 256-bit encryption.

Follow the procedure for the Java version that is installed on your proxy server host:

- [Enable AES 256-bit encryption for Java 8 update 141 (8u141) or earlier](#) on page 1122
- [Enable AES 256-bit encryption for Java 8 update 151 (8u151) or later](#) on page 1122

**Enable AES 256-bit encryption for Java 8 update 141 (8u141) or earlier**

Copy the Java Cryptography Extension (JCE) jurisdiction policy files to the Java home directory of each Edge Encryption proxy server host to enable AES 256-bit encryption for Java update 141 or earlier. 256-bit keys provide greater security than 128-bit keys.

**Role required:** admin

Your Java home directory includes the AES 128-bit policy files by default. To enable AES 256-bit encryption, you must overwrite the Java home directory policy files with the AES 256-bit policy files. You only need to download the JCE once, but you must update every Edge Encryption proxy server host.

**Note:** Java does not automatically allow unlimited strength keys. You must specifically enable the use of AES 256-bit encryption.

1. Download the JCE policy 8 ZIP file from Oracle.
2. Unzip the file.
3. On each proxy server host machine, copy the local_policy.jar and US_export_policy.jar files into the `<Java-home-directory>/jre/lib/security` folder.

**Enable AES 256-bit encryption for Java 8 update 151 (8u151) or later**

Edit the java.security policy file to enable AES 256-bit encryption for Java update 151 or later. 256-bit keys provide greater security than 128-bit keys.
Role required: admin

Perform this task in the Java home directory of each Edge Encryption proxy server host machine on which you want to enable AES 256-bit encryption.

Note: Java does not automatically allow unlimited strength keys. You must specifically enable the use of AES 256-bit encryption.

1. Navigate to `<jre_home>/lib/security/java.security` on the proxy server host machine, where `JRE_HOME` is an environment variable for both Windows and Linux.
2. Open the java.security policy file and find the line for the crypto.policy parameter, which is commented out by default.
3. Remove the `#` character from the beginning of the crypto.policy line to uncomment the line, and then save the file.

Note: If you do not uncomment the crypto.policy line, Java uses crypto.policy=limited, which restricts encryption to AES 128-bit keys.

Set up a keystore and encryption keys

Set up the keystore and encryption keys used by the Edge Encryption proxy server.

1. Carefully determine the appropriate type of keystore to use based on your organization’s needs.

<table>
<thead>
<tr>
<th>Supported keystore</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>File store</td>
<td>Keys are stored in a file in a file system accessed by the Edge Encryption proxy server. Because encryption keys stored in a file are not encrypted, it is your responsibility to protect these files.</td>
</tr>
</tbody>
</table>
| Java KeyStore       | A Java KeyStore:  
  • Stores keys in a Java JCEKS KeyStore.  
  • Is password protected and more secure than storing keys in a file in the file system.  
  • Can store multiple keys. A key alias represents each key, making it easier to manage multiple keys.  
  
  The Edge Encryption proxy ships with the Java JCEKS KeyStore file named keystore.jceks in the keystore directory. This keystore file contains the ServiceNow public key used to validate encryption rules signed by ServiceNow. |
<table>
<thead>
<tr>
<th>Supported keystore</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprise Key Management (EKM)</td>
<td>SafeNet KeySecure</td>
</tr>
<tr>
<td></td>
<td>Keys are stored and retrieved with SafeNet KeySecure key management.</td>
</tr>
<tr>
<td></td>
<td>You must secure a license with Gemalto, download the libraries, and install the SafeNet KeySecure keystore on a host machine in your network before configuring the keystore on the Edge Encryption proxy server.</td>
</tr>
<tr>
<td></td>
<td>Unbound Technology</td>
</tr>
<tr>
<td></td>
<td>The base64-encoded wrapped encryption key is stored as a text file on the Edge Encryption proxy server. The Unbound Technology implementation (previously Dyadic Security) maintains control of the wrapping key.</td>
</tr>
<tr>
<td></td>
<td>The Edge Encryption proxy server must run on the same machine as the Unbound technology client.</td>
</tr>
</tbody>
</table>

**Note:** If using a keystore other than the base system Java JCEKS KeyStore, you must import the ServiceNow public key into your keystore. The public key alias is servicenow.

2. Set up the keystore and encryption keys in your local network.

   *Set up a Java KeyStore keystore*

   You can use a Java KeyStore keystore to store encryption keys.

   You must use the Java 1.8 version of the keytool utility. A copy of the utility can be found in `<proxy install dir>/java/jre/bin/keytool`.

   The Edge Encryption proxy ships with the Java JCEKS KeyStore file named keystore.jceks in the keystore directory. This keystore file contains the ServiceNow public key used to validate encryption rules signed by ServiceNow.

1. Set up the keystore properties.
   a) Change to the `<installation directory>/conf/` directory.
   b) Open the `edgeencryption.properties` file.
   c) Enter the properties for the Java KeyStore.

2. Save and close the `edgeencryption.properties` file.

   After setting up the Java KeyStore, *Create encryption keys using the Java KeyStore keytool* on page 1124.

   Create encryption keys using the Java KeyStore keytool

   You can use the keytool shipped with the encryption proxy distribution to create AES 128-bit and AES 256-bit encryption keys.

   You must use the Java 1.8 version of the keytool utility. A copy of the utility can be found in `<proxy install dir>/java/jre/bin/keytool`.

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To find out more about the keytool utility, see the Java SE Documentation.

**Note:** The Java KeyStore requires that the alias name (key name, key alias) use lowercase letters and numbers.

1. Change to the keystore directory, `<installation directory>/keystore/`.
2. To create the encryption key, run one of the following commands.

   **Note:** If you choose to run these commands from a directory other than the keystore directory, that is you skipped the previous step, you must change the `-keystore` option to include the path from your current directory to the keystore directory. For example, if you were in the `<installation directory>/bin` directory, the option would be `-keystore ../keystore/keystore.jceks`.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AES 128</td>
<td><code>keytool -genseckey -alias 128bitkey -keyalg aes -keysize 128 -keystore keystore.jceks -storetype jceks</code></td>
</tr>
<tr>
<td>AES 256</td>
<td><code>keytool -genseckey -alias 256bitkey -keyalg aes -keysize 256 -keystore keystore.jceks -storetype jceks</code></td>
</tr>
</tbody>
</table>

You add the alias on the instance when you assign default keys.

**Note:** The key password must be the same as the keystore password.

**Set up a SafeNet KeySecure keystore**

If you are using a SafeNet keystore, copy a set of libraries into the proxy distribution directory.

You must install and set up the SafeNet keystore before performing this step. Secure a license with Gemalto in order to download the libraries.

**Note:** On Linux, file paths use a forward slash (/).

1. Copy these files to the `<installation directory>/lib` directory:
   - `ingrianNAE-<version>.jar`
   - `ingrianlog4j-api-<version>.jar`
   - `ingrianlog4j-core-<version>.jar`

2. Change to the `<installation directory>/conf/` directory, and open the `edgeencryption.properties` file.
3. Enter the properties for the SafeNet keystore.

An example for a SafeNet keystore using username and password authentication:

```
edgeencryption.nae.retries = 3
edgeencryption.nae.enabled = true
edgeencryption.nae.server = url
edgeencryption.nae.port = 9000
edgeencryption.nae.protocol = ssl
edgeencryption.nae.keystore.path = keystore/safenet_truststore
edgeencryption.nae.keystore.password = password
edgeencryption.nae.user = safenet_user
edgeencryption.nae.password = safenet_password
```

An example for a SafeNet keystore using client certificate authentication. This authentication method eliminates the need to store the SafeNet server username and password in the properties file.
edgeencryption.nae.retries = 3
edgeencryption.nae.enabled = true
edgeencryption.nae.server = url
edgeencryption.nae.port = 9000
edgeencryption.nae.protocol = ssl
edgeencryption.nae.keystore.path = keystore/safenet_clientcert
edgeencryption.nae.keystore.password = password
edgeencryption.nae.client.certificate = cert_name

4. Add or create a key in the SafeNet keystore.
   You add the key name (alias) on the instance when you assign default keys.

5. Save and close the edgeencryption.properties file.

Set up Unbound Technology keys
To use Unbound Technology (previously Dyadic Security) keys with Edge Encryption, store the base64-encoded wrapped encryption key as text file on the Edge Encryption proxy server and provide the wrapping key alias. The Unbound Technology implementation maintains control of the wrapping key.

Role required: security_admin

In your Unbound Technology implementation, identify both the wrapping key and the wrapped key. Export the wrapped key in base64-encoded text format. Save the file using the key alias as the name with no file extension.

Note: If using Unbound Technology encryption keys with Edge Encryption, install the proxy server using the command line installer on the Unbound client machine. The Edge Encryption proxy server must run on the same machine as the Unbound technology client.

1. Add the wrapped encryption key in base64-encoded text format to the <proxy-installation-directory>/keys directory. The name of the file must be the key alias with no file extension.

2. Update the edgeencryption.properties file.
   a) Change to the <proxy-installation-directory>/conf directory.
   b) Open the edgeencryption.properties file.
   c) Enter the File store properties. Set the value of edgeencryption.keyfile.directory to keys. This property directs the proxy server to look for the encryption key in the <Java-home-directory>/keys directory.
      For more information on Edge Encryption properties, see Edge Encryption proxy server properties.
   d) Uncomment the properties for the Dyadic provider configuration. Set the value of edgeencryption.ekm.provider.rsa.wrapping.key.alias to the wrapping key alias in your Unbound implementation.
   e) Save and close the file.

Add the encryption key alias to the instance. The encryption key alias is the file name of the wrapped encryption key added to the <proxy-installation-directory>/keys directory. For example, if the file in the directory is named myunboundkey, add this name to the Key alias field. See Configure encryption keys on the instance on page 1127.

Create an encryption key stored in a file
You can use a simple text file as a keystore. Each file holds a single encryption key.

This step creates both the key storage and the encryption key.
1. Create a file in the /keys folder of the proxy server installation directory.

2. Add the encryption key to the file.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AES 128</td>
<td>Place the encryption key, exactly 16 bytes, into the file.</td>
</tr>
<tr>
<td>AES 256</td>
<td>Place the encryption key, exactly 32 bytes, into the file.</td>
</tr>
</tbody>
</table>

3. Update the edgeencryption.properties file.
   a) Change to the <installation directory>/conf/ directory.
   b) Open the edgeencryption.properties file.
   c) Enter the properties for the file store.
   d) Save and close the file.

Configure encryption keys on the instance

Edge Encryption provides the tools to manage encryption keys without taking the proxy offline.

Role required: security_admin

Before setting up new encryption keys on the instance:

1. Create the encryption key.

2. Make the new key available to all encryption proxies. Either copy the file or Java KeyStore file to each proxy, or ensure that each proxy has access to the Java KeyStore or EKM device.

Key aliases must be unique. Each key alias must have the same key size and type on each proxy, or the key cannot be assigned as the default.

1. Navigate to Edge Encryption Configuration Encryption Key Configuration Set Up Keys.

2. On the Add New Keys section of the form, complete the following steps to add a new key.

   a) Double-click in the row that says Insert a new row....
   b) In the edit box, enter a name for the key, then click the check mark.

   Key aliases are lowercase letters and numbers. Capital letters are changed to lowercase letters when you click Update. Key aliases must be unique.

   **Note:** If using Unbound technology keys, add the encryption key alias. The encryption key alias is the file name of the wrapped encryption key added to the <proxy-installation-
directory>/keys directory. For example, if the file in the directory is named myunboundkey, add this name to the Key alias field.

c) In the same row, double-click in the Key size column.
d) In the select box, select a key size, either 128 bits or 256 bits, then click the check mark.
e) In the same row, double-click in the Type column.
f) In the select box, select a key type, either File, Keystore, SafeNet, or Unbound, then click the check mark.
g) When you are done adding keys, click Next Step.
You must specify an alias, key size, and key type for each key before moving on.

3. On the Keys Status section of the form, check the State of the key and ensure that it is Available. This may take a few minutes. When the key is Available, click Next Step.

Note: If using SafeNet versioned keys, an additional column appears for the Key version. The Key version cannot be edited.

The instance tracks the status of every encryption key available to any proxy. When a key is available on all proxies, its state becomes Available. If the state does not change after a few minutes, check to ensure that the key is available on all proxies. If the state remains Unavailable, one or more of the proxies does not have the key.

Table 382: Encryption key states

<table>
<thead>
<tr>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available</td>
<td>All online proxies have the key.</td>
</tr>
<tr>
<td>Unavailable</td>
<td>This is a new key and the proxies have not yet loaded the key, or at least one proxy failed to load the key.</td>
</tr>
</tbody>
</table>

4. On the Change Default Keys section of the form, do one of the following:
   - Type in the key alias.
   - Click the magnifying glass icon and select an alias.

Note: If using SafeNet versioned keys, an additional field appears for the Key version. The Key version is grayed out and cannot be edited.

Note: If using SafeNet versioned keys, choose only the most recent key version. If you choose an earlier version, the following message appears when you click Update or Next Step:
One of the default keys chosen is not the latest version available for the key. Please use the latest version.

Note: If using SafeNet versioned keys, and if the default keys are not the latest versions of the SafeNet keys, an Update default keys to latest version link appears in the Related Links. Click the link to update the default keys to use the latest version.

Click Next Step.

5. On the Schedule Key Rotation section of the form, schedule a mass key rotation job or single key rotation job to encrypt existing data using the new encryption key.
If you do not run a mass key rotation job or single key rotation job, existing data remains encrypted with the old key until the data is accessed again.

Configure additional properties in the Edge Encryption properties file

After installing the Edge Encryption proxy server in your network and setting up your keystore and keys, configure the additional Edge Encryption properties.

1. Open the `<installation directory>/conf/edgeencryption.properties` file and configure the following Edge Encryption proxy server properties:
   - Target (instance) properties
   - User account properties
   - Proxy properties
   - If using order preserving encryption types or encryption patterns, configure the `proxy database properties`
   - Clear text and static IV properties

2. Save and close the file.

Configure a web proxy

If your network uses a web proxy, you can set up the Edge Encryption proxy to use the web proxy.

If your network does not use a web proxy, leave the `web proxy properties` in the configuration file commented out.

The Edge Encryption proxy server supports HTTP connection to and basic authentication with the web proxy.

1. Change to the `<installation directory>/conf/` directory.
2. Open the `edgeencryption.properties` file.
3. Configure the `web proxy properties`.
4. Save and close the `edgeencryption.properties` file.
5. If the web proxy is using a customer-specific server certificate, add this certificate to the JVM used by the Edge Encryption proxy server to establish trust between the web proxy and the Edge Encryption proxy server.
   a) cd to `<Java home directory>/jre/lib/security/cacerts`
   b) Execute the command: `keytool -keystore cacerts -importcert -alias <chooseAlias> -file <certificateFile>`

Set the proxy server initial memory limit and upper bound memory limit

Set the initial memory limit and upper bound memory limit to specify how much memory the proxy server can consume. Set these limits to avoid performance issues in your Edge Encryption implementation.

As a guideline, set both the initial memory limit and the upper bound memory limit to the same value. On any machine, allocate 2 GB of the physical memory to the operating system (OS). Then allocate the rest of the physical memory to the heap using the initial memory limit and upper bound memory limit properties. For example, on a machine with 8 GB of memory, allocate 2 GB to the OS, and allocate the remaining 6 GB (6144 m) to the initial and upper bound memory.
**Important:** If your Edge Encryption proxy server is running, you must stop and restart the proxy server after updating these properties.

1. In your proxy server directory, open `<install dir>/conf/wrapper.conf`.
2. To set the initial memory limit, add the following line at the end of the file:
   
   ```
   wrapper.java.additional.<number>=-Xms<min_memory_in_MB>m
   ```
   
   Set `<number>` to the next available `<number>` in the sequence of `wrapper.java.additional.<number>` properties defined in the `wrapper.conf` file.
   
   For example, you have the following list of `wrapper.java.additional.<number>` properties:
   
   ```
   wrapper.java.additional.1=
   wrapper.java.additional.2=
   ```
   
   The maximum `<number>` in the above list is 2. When you add the `wrapper.java.additional.<number>=-Xms<min_memory_in_MB>m` line, set `<number>` to 3, the next available number.
   
   **Important:** Do not leave gaps in the numbering sequence.

   Set `<min_memory_in_MB>` to the number of megabytes of memory remaining after allocating 2 GB of memory to the OS.

3. Set the upper bound memory limit.
   
   Because an upper bound memory limit is not set in the base system, the proxy server can use all available memory. If other services are running on the server, you may want to set the upper bound memory limit.
   
   Add the following line at the end of the file:
   
   ```
   wrapper.java.additional.<number>=-Xmx<max_memory_in_MB>m
   ```
   
   Set `<number>` to the next available `<number>` in the sequence of `wrapper.java.additional.<number>` properties defined in the `wrapper.conf` file.
   
   For example, you have the following list of `wrapper.java.additional.<number>` properties:
   
   ```
   wrapper.java.additional.1=
   wrapper.java.additional.2=
   ```
   
   The maximum `<number>` in the above list is 2. When you add the `wrapper.java.additional.<number>=-Xmx<max_memory_in_MB>m` line, set `<number>` to 3, the next available number.
   
   **Note:** Do not leave gaps in the numbering sequence.

   Set `<max_memory_in_MB>` to the number of megabytes of memory remaining after allocating 2 GB of memory to the OS.

4. Save and close the file.

**Example: Setting proxy server initial and upper bound memory limits**

```
wrapper.java.additional.1 = -Djava.io.tmpdir=./tmp
wrapper.java.additional.2 = -Dcloudedge.home.dist=..
# must ensure UTF8 encoding when running on Windows
wrapper.java.additional.3 = -Dfile.encoding=UTF8
# additional properties for heap settings
wrapper.java.additional.4 = -Xms6144m
wrapper.java.additional.5 = -Xmx6144m
```

*Start the Edge Encryption proxy on page 1131.*
Start the Edge Encryption proxy

After an Edge Encryption proxy is installed and configured, you can start the proxy from the command line. Before starting the encryption proxy, verify the following:

- The Edge Encryption plugin is activated on the instance.
- The edgeencryption.properties file on this machine has been configured.
- If using an order preserving encryption type or encryption patterns, the proxy database is running.

**Note:** The first time you set up the edgeencryption.properties file or change properties, you may not want to set the password encryption property. After you have verified that everything is working, you can set the password encryption property, shut down the proxy, and then restart the proxy.

1. Run the proxy server.

   **Option** | **Description**
   --- | ---
   **On a Linux machine** | 1. cd to ServerName_port  
   | 2. Execute ./startup.sh
   **On a Windows machine** | Perform the following steps from the command line as admin:  
   | 1. cd to ServerName_port/bin  
   | 2. Execute edgeencryption.bat start

2. Check the log on the proxy server to verify that the proxy is running.

Obfuscate passwords in the properties file

You can obfuscate passwords in the edgeencryption.properties file to share the properties file without revealing clear text passwords.

Make sure that the Edge Encryption proxy server is set up and successfully running before you set this property. Before setting this property, Stop the Edge Encryption proxy on page 1132.

Setting this property may make it difficult to debug connection and access issues during initial startup. Only set this property in production environments after the proxy has been set up and tested successfully.

1. Change to the `<installation directory>/conf/` directory.
2. In the conf directory, create a text file containing a complex string or phrase that can be used as a passphrase which the proxy uses to obfuscate the passwords in the edgeencryption.properties file. This passphrase should be a random and complex phrase not related to the passwords themselves.
3. Open the edgeencryption.properties file.
4. Set the password encryption property.
5. Save and close the edgeencryption.properties file.

After setting this property, you can Start the Edge Encryption proxy on page 1131.

Manually add an additional proxy

After the first Edge Encryption proxy is properly configured and tested, you can set up additional proxies on a Linux or Windows machine. Installing multiple proxies on the same machine is not recommended.
Add additional proxy servers on additional machines to ensure an optimal environment. See *Sizing your Edge Encryption environment* on page 1099 to determine the number of additional proxies needed.

**Note**: Make sure that all proxies have the same encryption keys and the same RSA key pair used to digitally sign encryption configuration and encryption rules. If a proxy database was set up as part of the installation, all proxies must use the same proxy database.

1. Install the proxy using the appropriate command. See [*Install the Edge Encryption proxy server (interactive installer)*](#) on page 1106.

2. Copy all the encryption keys and the edgeencryption.properties file from the first proxy to the new proxy.
   Encryption keys may be located in the proxy keystore, in the /keys directory, or in a SafeNet KeySecure keystore.

3. Open the edgeencryption.properties file on the new proxy.

4. Change the following properties:

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>edgeencryption.proxy.name</td>
<td>Unique name of the proxy server</td>
</tr>
<tr>
<td>edgeencryption.proxy.host</td>
<td>The server name, IP address, or fully-qualified domain name of the computer running the proxy.</td>
</tr>
<tr>
<td>edgeencryption.proxy.http.port</td>
<td>Port on the proxy for HTTP communication. Must be unique across all processes on the machine.</td>
</tr>
<tr>
<td>edgeencryption.proxy.https.port</td>
<td>Port on the proxy for HTTPS communication. Must be unique across processes on the machine.</td>
</tr>
</tbody>
</table>

5. If installing the proxy server on a Windows machine, you must change the name of the service. Open the conf/wrapper.conf file on the new proxy and add the following properties.

   **Caution**: You must perform this step before launching the proxy server.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>wrapper.ntservice.name</td>
<td>Unique name of the Edge Encryption proxy service.</td>
</tr>
<tr>
<td>wrapper.ntservice.displayname</td>
<td>Edge Encryption proxy service display name.</td>
</tr>
<tr>
<td>wrapper.ntservice.description (Optional)</td>
<td>Proxy server description.</td>
</tr>
</tbody>
</table>

6. Save and close the file.

7. Launch the proxy using the appropriate command. See [*Start the Edge Encryption proxy*](#) on page 1131.

---

**Stop the Edge Encryption proxy**

You can stop an Edge Encryption proxy from the command line.

1. Stop the proxy server.
<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>On a Linux machine</strong></td>
<td>Execute ./shutdown.sh</td>
</tr>
<tr>
<td><strong>On a Windows machine</strong></td>
<td>Execute edgeencryption.bat stop</td>
</tr>
<tr>
<td></td>
<td>To remove the Windows service, execute</td>
</tr>
<tr>
<td></td>
<td>edgeencryption.bat remove</td>
</tr>
</tbody>
</table>

2. Check the log on the proxy server to verify that the proxy has stopped.

**Uninstall the Edge Encryption proxy on Linux**

You can uninstall the Edge Encryption proxy. If you are upgrading the proxy, it is not necessary to shut down and uninstall the current version.

You must have access to the computer running the Edge Encryption proxy.

Before shutting down the Edge Encryption proxy, ensure that no users are connected to the instance using the proxy.

The encryption proxy running on Linux operates as a single process. You can end this process to accommodate such tasks as redeploying the encryption proxy to another host machine, updating the proxy version, updating the Java version, or changing the unique name of the encryption proxy when deploying the encryption proxy on multiple proxy servers.

1. You may want to save the edgeencryption.properties file before deleting the distribution directory.
2. Execute the shutdown.sh shell script.
3. Check the log on the proxy server to verify that the proxy server is shut down.
4. Delete the files in the distribution folder.

**Uninstall the Edge Encryption proxy on Windows**

You can uninstall the Edge Encryption proxy. If you are upgrading the proxy, it is not necessary to shut down and uninstall the current version.

You must have access to the computer running the Edge Encryption proxy.

Before shutting down the Edge Encryption proxy, ensure that no users are connected to the instance using the proxy.

1. You may want to save the edgeencryption.properties file before deleting the distribution directory.
2. Execute edgeencryption.bat stop
3. Execute edgeencryption.bat remove
4. Check the log on the proxy server to verify that the proxy server is shutdown.
5. Delete the files in the distribution folder.

**Set up multiple provider SSO with Edge Encryption**

If implementing multiple provider single sign-on (SSO) with Edge Encryption enabled, some users may need to log in to your instance through the Edge Encryption proxy server, while other users may not.

Set up multiple provider SSO to enable logging in through the Edge Encryption proxy server URL or the instance URL.

- Role required: admin
• Enable the Integration - Multiple Provider Single Sign-On Installer plugin (com.snc.integration.sso.multi.installer).
• Enable the Edge Encryption plugin (com.glide.edgeencryption) and ensure that one or more proxy servers are set up in your network.
• Determine the URL for the Edge Encryption proxy server that users will log in through using multiple provider SSO. To determine the URL of an Edge Encryption proxy server, see Edge Encryption installation on page 1102.

• If routing all users through the Edge Encryption proxy server, set up your identify provider record and define the proxy server URL in the ServiceNow Homepage, Entity ID / Issuer, and Audience URI fields.
• To route some users through the proxy server and some users to the instance, create two identify provider records. Both records use the same value in the Identity Provider URL field. However, one of the records routes through the proxy server, while the other routes to the instance.

1. Enable the duplication of identity provider URLs in identity provider records.
   A unique constraint prevents duplication of the identity provider URL in two different identity provider records. You can enable duplication of the identity provider URL in multiple IdP records by setting a field to false.
   a) Navigate to System Definition Dictionary .
   b) Open the definition record for the idp field of in the Identity Providers table [saml2_update1_properties].
   c) Configure the form to add the Unique field.
   d) Ensure that the value of the Unique field is set to false.

2. Navigate to Multi-Provider SSO Identity Providers .
3. Create two identity provider records for the same identity provider: one using the instance URL and one using the Edge Encryption proxy server URL.
   To create an identity provider record, see Create and update identity providers.
   a) For the Edge Encryption proxy server URL, complete the form using these values.

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identity Provider URL</td>
<td>Imported from IdP metadata.</td>
</tr>
<tr>
<td>ServiceNow Homepage</td>
<td>The URL for your proxy server homepage. For example: <code>https://&lt;proxy hostname&gt;:&lt;port&gt;/navpage.do</code></td>
</tr>
<tr>
<td>Entity ID / Issuer</td>
<td><code>https://&lt;proxy hostname&gt;:&lt;port&gt;</code></td>
</tr>
<tr>
<td>Audience URI</td>
<td><code>https://&lt;proxy hostname&gt;:&lt;port&gt;</code></td>
</tr>
</tbody>
</table>

   b) Click Submit.
   c) For the instance URL, complete the form using these values.

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identity Provider URL</td>
<td>Imported from IdP metadata.</td>
</tr>
<tr>
<td>ServiceNow Homepage</td>
<td><code>https://&lt;instance&gt;.service-now.com/navpage.do</code></td>
</tr>
<tr>
<td>Entity ID / Issuer</td>
<td><code>https://&lt;instance&gt;.service-now.com/navpage.do</code></td>
</tr>
<tr>
<td>Audience URI</td>
<td><code>https://&lt;instance&gt;.service-now.com/navpage.do</code></td>
</tr>
</tbody>
</table>
d) Click Submit.

4. If using more than one identity provider, modify the MultiSSO installation exit.
   a) Navigate to System Definition Installation Exits.
      The system displays the current list of installation exits.
   b) Open the MultiSSO installation exit.
   c) Locate the following statement in the Script field.

   ```javascript
   var samlResponseTxt = request.getParameter("SAMLResponse");
   if (!GlideSession.get().isLoggedin() && GlideStringUtil.notNull(samlResponseTxt)) {
       var idpRecord = this.getIdPRecord(request);
       if (idpRecord) {
           SSO_Helper.debug("IdP found based on SAML response: " +
           idpRecord.getUniqueValue() +
           idpRecord.getUniqueValue(), false, null, true);
           return new SSO_Helper(idpRecord.getUniqueValue(), false, null, true);
       }
   }
   
   d) Replace the statement with the following code.

   ```javascript
   var samlResponseTxt = request.getParameter("SAMLResponse");
   if (!GlideSession.get().isLoggedin() && GlideStringUtil.notNull(samlResponseTxt)) {
       /* // You have two profiles that use the same IdP entity id it cannot use
           // the IdP issuer / entity id from the response otherwise it may result in the
           // wrong IdP profile. IdP initiated login will not work
           var idpRecord = this.getIdPRecord(request);
           if (idpRecord) {
               SSO_Helper.debug("IdP found based on SAML response: " +
               idpRecord.getUniqueValue() +
               idpRecord.getUniqueValue(), false, null, true);
               return new SSO_Helper(idpRecord.getUniqueValue(), false, null, true);"
           */
       return new SSO_Helper(null, true);
   }
   
   Note: IdP initiated login does not work in this configuration.

   e) Click Update.

5. If using more than one company, Configure users for Multi-Provider SSO. Update the sys_id of the identity provider record depending on the user.
   - To configure a user to log in through the Edge Encryption proxy server, use the sys_id of the identity provider record that uses the Edge Encryption proxy server URL.
   - To configure a user to log in to the instance, use the sys_id of the identity provider record that uses the instance URL.
Table 383: Login URLs

<table>
<thead>
<tr>
<th>URL</th>
<th>Login destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>https://&lt;instance name&gt;.service-now.com/login_with_sso.do?glide_sso_id=&lt;sys_id of IdP record for the instance URL&gt;</td>
<td>Logs in through the instance.</td>
</tr>
</tbody>
</table>

Edge Encryption proxy server properties

The edgeencryption.properties configuration file located in the <installation directory>/conf/ folder contains properties used to configure your environment.

Target (instance) properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>edgeencryption.target.host</td>
<td>Host name for the instance. Must be the same for all encryption proxies connecting to the same instance. This property is set when the proxy is installed. For example, instancename.servicenow.com</td>
</tr>
<tr>
<td>edgeencryption.target.port</td>
<td>Instance port. Must be the same for all encryption proxies connecting to the same instance. This property is set when the proxy is installed.</td>
</tr>
<tr>
<td>edgeencryption.target.protocol</td>
<td>Instance protocol. Must be the same for all encryption proxies connecting to the same instance. This property is set when the proxy is installed. Options include:</td>
</tr>
<tr>
<td></td>
<td>• http</td>
</tr>
<tr>
<td></td>
<td>• https</td>
</tr>
</tbody>
</table>

User account properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>edgeencryption.target.username</td>
<td>User name that the proxy uses to log in to the instance. The user must have the edge_encryption role. See Set up an Edge Encryption user account on page 1104.</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>edgeencryption.target.password</td>
<td>Password that the proxy uses to log in to the instance.</td>
</tr>
</tbody>
</table>

**Proxy properties**

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>edgeencryption.proxy.host</td>
<td>Server name, IP address, or fully qualified domain name of the computer running the proxy. Along with the port, this property defines the URL used by the client to access the proxy server.</td>
</tr>
<tr>
<td>edgeencryption.proxy.name</td>
<td>Proxy name. Must be unique for each proxy.</td>
</tr>
<tr>
<td>edgeencryption.proxy.http.port</td>
<td>Port on the proxy for HTTP communication.</td>
</tr>
<tr>
<td>edgeencryption.proxy.https.port</td>
<td>Port on the proxy for HTTPS communication.</td>
</tr>
</tbody>
</table>

**SSL certificate properties**

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>edgeencryption.proxy.https.cert.alias</td>
<td>Alias of the certificate provided by the proxy server to connecting clients.</td>
</tr>
<tr>
<td>edgeencryption.proxy.https.keystore.path</td>
<td>Path to the keystore that contains the HTTPS certificate.</td>
</tr>
<tr>
<td>edgeencryption.proxy.https.keystore.password</td>
<td>Password for the keystore that contains the HTTPS certificate.</td>
</tr>
</tbody>
</table>

**Proxy configuration locked property**

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>edgeencryption.proxy.locked</td>
<td>When true, the proxy does not accept encryption configuration changes or encryption rule changes from the instance. Set this property on the production instance after all encryption configurations and rules are final.</td>
</tr>
</tbody>
</table>
Proxy database properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>edgeencryption.db.url</td>
<td>Proxy database location. Must be the same for all encryption proxies connecting to the same instance.</td>
</tr>
<tr>
<td>edgeencryption.db.user</td>
<td>User name for accessing the proxy database. Must be the same for all encryption proxies connecting to the same instance.</td>
</tr>
<tr>
<td>edgeencryption.db.password</td>
<td>Password to access the proxy database. Must be the same for all encryption proxies connecting to the same instance.</td>
</tr>
<tr>
<td>edgeencryption.db.name</td>
<td>Proxy database name. Must be the same for all encryption proxies connecting to the same instance.</td>
</tr>
<tr>
<td></td>
<td>• Default value: edgeencryption</td>
</tr>
<tr>
<td>edgeencryption.db.bootstrap.file</td>
<td>Bootstrap file for the proxy database. The file is relative to the sql/ directory. Must be the same for all encryption proxies connecting to the same instance.</td>
</tr>
</tbody>
</table>

**Note:** Under normal circumstances, this parameter should not be changed.

Digital signature properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>edgeencryption.proxy.signature.keystore.path</td>
<td>Path and Java KeyStore file name.</td>
</tr>
<tr>
<td>edgeencryption.proxy.signature.keystore.password</td>
<td>Password. The default password is &lt;changeme&gt;. Change the password after installing the Java KeyStore.</td>
</tr>
<tr>
<td>edgeencryption.proxy.signature.keystore.keyalias</td>
<td>The key alias given as the -alias argument when the RSA key pair is generated.</td>
</tr>
</tbody>
</table>

NAE device keystore

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>edgeencryption.nae.retries</td>
<td>Number of retries to make.</td>
</tr>
<tr>
<td>edgeencryption.nae.enabled</td>
<td>Setting indicates whether an NAE device is available.</td>
</tr>
<tr>
<td>edgeencryption.nae.server</td>
<td>Name of the NAE server.</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>edgeencryption.nae.port</td>
<td>Port used by the NAE server.</td>
</tr>
<tr>
<td>edgeencryption.nae.protocol</td>
<td>Protocol used by the NAE server.</td>
</tr>
<tr>
<td>edgeencryption.nae.keystore.path</td>
<td>Path to the keystore on the NAE server.</td>
</tr>
<tr>
<td>edgeencryption.nae.keystore.password</td>
<td>NAE keystore password.</td>
</tr>
<tr>
<td>edgeencryption.nae.username</td>
<td>User name to use to authenticate with the NAE device.</td>
</tr>
<tr>
<td>edgeencryption.nae.password</td>
<td>Password to use to authenticate with the NAE device.</td>
</tr>
<tr>
<td>edgeencryption.nae.client.certificate</td>
<td>Certificate located in the keystore on the NAE server.</td>
</tr>
<tr>
<td></td>
<td>Set this property to authenticate using a certificate instead of a username and password.</td>
</tr>
</tbody>
</table>

**Clear text and static IV properties**

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>edgeencryption.customer.assigned.known.cleartext</td>
<td>Clear text to let the instance verify that all proxies are using the same keys. At startup, the proxy encrypts the clear text and sends the encrypted text to the instance. The instance does not know the clear text, nor are keys sent to the instance. This property must be the same for all proxies.</td>
</tr>
<tr>
<td>edgeencryption.encypter.static.iv</td>
<td>Static IV (initialization vector) used in equality-preserving and order-preserving encryption. This property must be the same for all proxies and it must be exactly 16 bytes (16 ASCII characters).</td>
</tr>
</tbody>
</table>

**Password property**

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>edgeencryption.encypter.properties.password</td>
<td>Name of the file in the conf folder that contains a string used within a secure process to obfuscate passwords in the edgeencryption.properties file. If this property is not set, passwords in your properties file appear in clear text. Leave this property blank until after the proxy configuration has been set up and tested.</td>
</tr>
</tbody>
</table>
## Web proxy properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>edgeencryption.webproxy.host</code></td>
<td>Web proxy name or IP address.</td>
</tr>
<tr>
<td><code>edgeencryption.webproxy.port</code></td>
<td>Port on the web proxy.</td>
</tr>
<tr>
<td><code>edgeencryption.webproxy.user</code></td>
<td>User name used to connect to the web proxy. If your web proxy does not use authentication, leave this property commented out.</td>
</tr>
<tr>
<td><code>edgeencryption.webproxy.password</code></td>
<td>Password to use to connect to the web proxy. If your web proxy does not use authentication, leave this property commented out.</td>
</tr>
</tbody>
</table>

## Java KeyStore properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>edgeencryption.keystore.path</code></td>
<td>Path to the Java KeyStore. If using a file store or a SafeNet KeySecure keystore, leave this property commented out.</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
</tr>
<tr>
<td></td>
<td><code>edgeencryption.keystore.path = keystore/keystore.jceks</code></td>
</tr>
<tr>
<td><code>edgeencryption.keystore.password</code></td>
<td>Password the proxy uses to connect to the Java KeyStore. If using a file store or a SafeNet KeySecure keystore, leave this property commented out.</td>
</tr>
</tbody>
</table>

## File store properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>edgeencryption.keyfile.directory</code></td>
<td>The directory specifies where key files are stored. If using the Java KeyStore or a SafeNet KeySecure keystore, leave this property commented out.</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
</tr>
<tr>
<td></td>
<td><code>edgeencryption.keyfile.directory=keys</code></td>
</tr>
<tr>
<td></td>
<td>If using Unbound Technology keys, uncomment this property and set the value to the keys directory.</td>
</tr>
</tbody>
</table>
## Unbound Technology provider properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>edgeencryption.ekm.provider.classname</code></td>
<td>Internal class name for the implementation.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Do not change this property.</td>
</tr>
<tr>
<td><code>edgeencryption.thirdparty.vendor.library.path</code></td>
<td>Path to the Unbound API JAR file on the Unbound client machine.</td>
</tr>
<tr>
<td><code>edgeencryption.ekm.provider.rsa.wrapping.key.alias</code></td>
<td>Wrapping key alias in the Unbound Technology implementation. Must be the same for all proxies.</td>
</tr>
</tbody>
</table>

## General configuration properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>edgeencryption.config.poll.interval</code></td>
<td>Poll interval in seconds. The default setting means that it takes 5 seconds for the proxy to learn of encryption configuration changes. Larger values cause the instance to take longer to detect an offline proxy.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Do not change this property. Changing the default setting of the Proxy Poll Interval can result in detection delays when a proxy comes online.</td>
</tr>
<tr>
<td><code>edgeencryption.rules.dir</code></td>
<td>Folder where the encryption rules are stored on the proxy.</td>
</tr>
<tr>
<td><code>edgeencryption.encryption.order_preserving.cache.enable</code></td>
<td>Setting determines whether caching is used to support order-preserving encryption types.</td>
</tr>
<tr>
<td><code>edgeencryption.encryption.order_preserving.cache.size</code></td>
<td>Maximum cache size, in bytes.</td>
</tr>
<tr>
<td><code>edgeencryption.jobs.concurrency</code></td>
<td>Maximum number of mass encryption jobs that can run concurrently on this proxy.</td>
</tr>
<tr>
<td><code>edgeencryption.jobs.requests_per_second</code></td>
<td>Number of http job requests per second that can be sent to the instance by this proxy.</td>
</tr>
<tr>
<td><code>edgeencryption.attachments.request.timeout.seconds</code></td>
<td>Attachment upload request timeout in seconds.</td>
</tr>
<tr>
<td><code>edgeencryption.request.buffer.size</code></td>
<td>Size of an encryption request. If an encryption request is larger than this size, the excess is saved to disk.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Do not change this property.</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>edgeencryption.httpclient.request.buffer.size</td>
<td>Size of the client request. If the client request is larger than this size, the excess is saved to disk.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Do not change this property.</td>
</tr>
<tr>
<td>edgeencryption.proxy.idle.timeout</td>
<td>Time in seconds after which a transaction times out. The default value is 300.</td>
</tr>
<tr>
<td>edgeencryption.proxy.keepalive.interval</td>
<td>Time in seconds between pings issued by the proxy to the instance. Pings are issued periodically to verify connectivity between the proxy and the instance. The default value is 10. The minimum value is 5.</td>
</tr>
<tr>
<td>edgeencryption.register.retry.count</td>
<td>Maximum number of times the proxy will ping the instance to try to register. The default is 0 (no limit).</td>
</tr>
<tr>
<td>edgeencryption.tokenization.exclusion.list</td>
<td>Encryption patterns cannot tokenize strings found in these fields.</td>
</tr>
</tbody>
</table>

### Proxy server performance properties

Proxy server performance properties are not present in the configuration file by default. To change the default values, you must add the properties and restart the proxy server. For more information, see *Edge Encryption diagnostics and performance* on page 1199.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>edgeencryption.stat.collection.enabled</td>
<td>Enables the collection of statistics used by the Edge Encryption proxy server performance dashboard.</td>
</tr>
<tr>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td></td>
<td>Add this property and set the value to false to disable the collection of statistics used by the Edge Encryption proxy server performance dashboard. After adding proxy server performance properties, you must restart the proxy server for the change to take effect.</td>
</tr>
<tr>
<td>edgeencryption.stat.collection.interval</td>
<td>Interval length in seconds during which the Edge Encryption proxy server collects statistics. The value cannot be less than 30 seconds.</td>
</tr>
<tr>
<td></td>
<td>• Default value: 30</td>
</tr>
<tr>
<td></td>
<td>After adding proxy server performance properties, you must restart the proxy server for the change to take effect.</td>
</tr>
</tbody>
</table>
### Deprecated proxy encryption properties

#### Table 384: Edge Encryption properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>edgeencryption.encrypter.default.key128</td>
<td>Specifies the name of the current AES 128 key. An AES 128 key must be available even if it is not used. Must be the same for all proxies.</td>
</tr>
<tr>
<td>edgeencryption.encrypter.default.key256</td>
<td>Specifies the name of the current AES 256 key. Must be the same for all proxies.</td>
</tr>
<tr>
<td>edgeencryption.encrypter.key</td>
<td>Specifies the key name. This property is specified for each key and is used to specify the default keys. This is the key alias integrated with the metadata that is included with each encrypted item and, therefore, is stored on the instance. The key name must use lowercase letters.</td>
</tr>
<tr>
<td>edgeencryption.encrypter.type</td>
<td>Specifies the type of encryption keystore system.</td>
</tr>
<tr>
<td>edgeencryption.encrypter.file</td>
<td>Specifies the path and file name of the text file associated with the key.</td>
</tr>
<tr>
<td>edgeencryption.encrypter.password</td>
<td>Specifies the password for accessing the keystore.</td>
</tr>
</tbody>
</table>

#### Using a load balancer with the Edge proxy server

You can use a load balancer to balance the load across the proxy servers in your Edge Encryption proxy setup. If the load balancer and proxy servers are using different ports, specify the host name and HTTPS port of the load balancer to enable users to view responses on their browser.

**Important:** All production environments should include at least two Edge Encryption proxy servers for redundancy.

#### Edge request processing without a load balancer

If you are not using a load balancer, a request is processed as described below.

1. The user issues a request from a browser.
2. The browser sends the request to the Edge proxy server.
3. The proxy server sends the request to the ServiceNow instance.
4. The ServiceNow instance returns the response to the proxy server.
5. The proxy server adds its own port number in the response header before returning the response to the user’s browser.

The request is completed successfully because the user can view the response from the proxy server at the port number specified in the response header.
Edge request processing with a load balancer

However, if you are using a load balancer, the user's browser communicates directly with the load balancer, not with the proxy server. A request is processed as described below.

**Note:** The following example uses 1025 as the proxy server port number.

1. The user issues a request from a browser.
2. The browser sends the request to a load balancer Virtual IP (VIP), also known as a Virtual Server.
3. The VIP is configured to point to the proxy server (for example, 10.2.200.148:1025), so the load balancer forwards the request to the proxy server.
4. The proxy server sends the request to the ServiceNow instance.
5. The ServiceNow instance returns the response to the proxy server.
6. The proxy server rewrites the location header in the response with values configured in the properties for risk-servicenow.dev.echonet:1025.
   - Host: edgeencryption.proxy.host
   - HTTP port: edgeencryption.proxy.http.port
   - HTTPS port: edgeencryption.proxy.https.port
7. The proxy server forwards the response to the load balancer with the location header pointing to the proxy server port.

The outcome depends on whether the load balancer and proxy servers are using the same port.
- If the load balancer and proxy servers are using the same port, the request succeeds because the user receives the response from the same port identified in the response header.
- If the load balancer and proxy servers are using different ports, the request fails because the user's browser communicates only with the load balancer, but the response is on the proxy server.

**Solution**

You could resolve the issue by simply using the load balancer and all Edge proxy servers on the same port, but this is not an ideal solution. A better solution is to enable the system to know which port the load balancer uses.

The London release adds properties to enable the Edge proxy server to reroute response messages to the load balancer if the proxy server and load balancer are using different ports.
- edgeencryption.proxy.rewrite.location.host specifies the host name used to access ServiceNow through the load balancer.
- edgeencryption.proxy.rewrite.location.https.port specifies the HTTPS port used to access ServiceNow through the load balancer.

**Configure the load balancer**

If the load balancer and proxy servers are using different ports, specify the host name and HTTPS port of the load balancer to enable users to view responses on their browser.

Roles required:
- local or domain administrator on a Windows host
• service user with full file system access on a Linux host

1. Login to the proxy server host as admin, domain admin, or a service user.
2. Navigate to the installation directory for the Edge proxy and select conf/edgeencryption.properties.
3. Set the following properties:

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
</table>
| edgeencryption.proxy.rewrite.location.host | If your Edge configuration includes a load balancer to balance the load among proxy servers, rewrites responses to the load balancer so requests can be completed.  
• If there is a load balancer in the proxy setup, specify the host name used to access ServiceNow through the load balancer.  
• Optional: If there is no load balancer in the proxy setup, can be set to the host name used by the proxy server. |
| edgeencryption.proxy.rewrite.location.https.port | If your Edge configuration includes a load balancer to balance the load among proxy servers, specifies the HTTPS port used to access ServiceNow through the load balancer.  
• If there is a load balancer in the configuration, specify the HTTPS port used to access ServiceNow through the load balancer.  
• Optional: If there is no load balancer in the configuration, can be set to the HTTPS port used by the proxy server. |

4. Save the file.

Requests can be completed because users can now view responses on their browser.

**Edge Encryption upgrades**

Both instance upgrades and proxy server upgrades require special consideration in an Edge Encryption environment.

**Instance upgrades**

Instance upgrades in an Edge Encryption environment require caution to ensure that Edge controls work properly after the instance upgrade.

During an instance upgrade, you should not add, edit, or delete the following:

• Edge Encryption configurations  
• Edge Encryption rules  
• Edge Encryption tokenization patterns
• Edge Encryption scheduled jobs
• Edge Encryption key configurations
• Edge Encryption scheduled upgrades
• Edge Encryption blacklist IP configurations

Any scheduled job running during the instance upgrade will not complete. To complete the interrupted job, rerun the job once the instance is upgraded. When you reschedule the job, the processing that occurred before the instance upgrade is not lost, and the job continues to process only the data that has not yet been processed.

Proxy server upgrades

Schedule a proxy upgrade to enable the instance to upgrade the Edge Encryption proxy server, or manually upgrade the proxy server at any time.

Scheduled upgrades

Schedule an upgrade to allow the instance to upgrade the proxy server at the scheduled time. This functionality is available by default after upgrading. A scheduled upgrade includes these events:

1. The proxy server checks with the instance to see if there is a new version available for upgrade. New versions generally become available when the instance is upgraded.
2. The administrator receives a notification upon logging in when a new version of the proxy server is available.
3. The administrator can Schedule an Edge Encryption proxy server upgrade for each proxy server.

   Note: Only users with the security_admin role can create an upgrade schedule through the proxy server.

4. Once the upgrade is scheduled, the proxy server automatically upgrades at the scheduled time. During the upgrade, the proxy server is offline for only a short time.

   Note: Because the proxy server restarts during the upgrade, it is offline for a short time. The amount of time is determined by your environment and how long it takes to stop and restart the proxy service.

5. During the scheduled upgrade, a new proxy directory is created and your configuration files are copied to the new directory. New properties are written to your existing properties file. The following files or directories in your old proxy directory are copied to the new proxy directory.

   • /conf directory
   • /keys directory
   • /keystore directory
   • java/jre/lib/security/cacerts file

As a result, your keys, keystores, settings, and certificates are preserved.

Caution: Only the above files are copied to the new proxy directory. Any other customized files in the proxy server directory are not preserved during a scheduled upgrade. The upgrade log file can be found in the original proxy directory in the following folder: <original-proxy-directory>/tmp/upgrade-wrapper/bin.
Prerequisites for scheduled upgrades

Before scheduling an upgrade for an Edge Encryption proxy, ensure the following:

1. The JAVA_HOME environment variable points to a java installation on the machine that is outside the Edge Encryption proxy’s directory structure.

2. The JAVA_HOME environment variable points to a java installation that is at version 1.8_u144 or higher.

3. The -Djava.io.tmpdir parameter in the wrapper.conf file of the Edge Encryption proxy points to a directory that is OUTSIDE the Edge Encryption proxy’s directory structure, and the proxy has read/write/execute permissions on the directory. Optionally, you could comment out the parameter entirely so that Java uses its default tmp location.

Manual upgrades

Instead of creating an upgrade schedule, you can manually upgrade each proxy server through the command line. See Manually upgrade an Edge Encryption proxy server running on Linux on page 1151 or Manually upgrade an Edge Encryption proxy server running on Windows on page 1151.

Proxy build status

You can easily identify whether a proxy server is out of date by navigating to Edge Encryption Configuration Proxies All. The status of your proxy build is indicated in the Proxy build column by the following colors:

- **Green**
  
  Your proxy server is up-to-date.

- **Yellow**
  
  Your proxy server is out-of-date and an upgrade is needed.

- **Orange**
  
  Upgrade failed. Your proxy server reverts to the old version to ensure that there is no downtime.
Troubleshoot a failed scheduled proxy upgrade

When a scheduled proxy upgrade fails, the proxy server reverts to the version you are upgrading from. All original data, keys, and configuration files are preserved. This process may take several minutes. Contact ServiceNow Customer Support to ensure a successful upgrade.

To determine the reason for the failure, you can check the Failure Reason in the upgrade schedule. In addition, the installation directory for the failed upgrade is maintained so that log files are available for troubleshooting.

**Caution:** Before deleting any extra proxy directories, always confirm which directory is current by reviewing the log files. If the log files have recent activity, the proxy might be connected to your instance.

If a scheduled proxy upgrade fails repeatedly, you can manually upgrade your proxy server. See *Manually upgrade an Edge Encryption proxy server running on Linux* on page 1151 and *Manually upgrade an Edge Encryption proxy server running on Windows* on page 1151.

Java minimum requirements

The host machine installing or running the Edge Encryption proxy server must maintain a supported version of Java:

- Java 8 update 121 (8u121)
- Java 8 update 141 (8u141)
- Java 8 update 151 (8u151) or later

**Note:** Java 8 update 131 (8u131) is not supported.

**Note:** Before installing the Edge Encryption proxy server, check that the $JAVA_HOME variable is pointing to a supported version of Java for each user that will run the proxy server. For example,
if installing the proxy server as a local administrator on Windows, check that the $JAVA_HOME variable is pointing to the correct version of Java system-wide. If installing on Linux, check that each user that will run the proxy server has this variable correctly defined. If a supported version of Java is not found, the Edge Encryption proxy server will not run.

If using AES 256-bit encryption with Java 8 update 141 (8u141) or lower, you must install the Java Cryptography Extension (JCE) jurisdiction policy files by copying them into the system Java home directory of each Edge Encryption proxy server host. Add these files to the <Java-home-directory>/jre/lib/security folder before performing a scheduled or manual upgrade. To install the AES 256-bit encryption policy files, see Enable AES 256-bit encryption for Java 8 update 141 (8u141) or earlier on page 1122.

**Mixed proxy-version environments**

Although an environment running old versions of the proxy server with up-to-date versions of the proxy server is not recommended, it is supported if all proxy servers are within the same version family as your instance. For example, if you have an instance on the London release, your environment supports proxy servers from any London patch or hot fix. However, the following limitations apply.

- If one proxy server supports functionality that another proxy does not support, you will see inconsistent behavior, depending on which proxy server is used.
- If a proxy server is out-of-date, it may not include recent security enhancements.

If a proxy server from a previous release is registered with a newer release of the instance, you will receive regular notifications that the proxy server is out-of-date. To ensure an optimal and secure environment, ServiceNow recommends always upgrading your proxy server to the most recent version of the software supported by your instance.

**Schedule an Edge Encryption proxy server upgrade**

Create an upgrade schedule to enable the instance to upgrade an out-of-date proxy server.

To schedule an upgrade, you must be logged in to your instance through the proxy server.

If using AES 256-bit encryption with Java 8 update 141 (8u141) or lower, you must install the Java Cryptography Extension (JCE) jurisdiction policy files by copying them into the system Java home directory of each Edge Encryption proxy server host. Add these files to the <Java-home-directory>/jre/lib/security folder before performing a scheduled or manual upgrade. To install the AES 256-bit encryption policy files, see Enable AES 256-bit encryption for Java 8 update 141 (8u141) or earlier on page 1122.

Role required: security_admin

Once the upgrade is scheduled, the proxy server automatically upgrades at the scheduled time. During the upgrade, the proxy server is offline for only a short time.

**Note:** Because the proxy server restarts during the upgrade, it is offline for a short time. The amount of time is determined by your environment and how long it takes to stop and restart the proxy service.

During the scheduled upgrade, a new proxy directory is created and your configuration files are copied to the new directory. New properties are written to your existing properties file. The following files or directories in your old proxy directory are copied to the new proxy directory.

- /conf directory
- /keys directory
- /keystore directory
- java/jre/lib/security/cacerts file
As a result, your keys, keystores, settings, and certificates are preserved.

**Caution:** Only the above files are copied to the new proxy directory. Any other customized files in the proxy server directory will not be preserved during a scheduled upgrade. The upgrade log file can be found in the original proxy directory in the following folder: `<original-proxy-directory>/tmp/upgrade-wrapper/bin`.

If multiple proxy servers are out-of-date, you must schedule an upgrade for each proxy server individually.

**Note:** Avoid hosting multiple proxy servers on the same machine. However, if your environment includes this configuration, do not schedule upgrades to multiple proxies on the same machine at the same time.

1. Navigate to Edge Encryption Configuration Proxies Upgrade Schedules.
2. Click New.
3. Complete the form.

**Table 385: Edge Encryption Proxy Upgrade Schedule form**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proxy server</td>
<td>Proxy server being upgraded.</td>
</tr>
<tr>
<td>Target version</td>
<td>Version to which you are upgrading your proxy server. This value is read-only and set to the most up-to-date proxy version available for your instance.</td>
</tr>
<tr>
<td>Scheduled Start Time</td>
<td>Date and time on which to start the upgrade.</td>
</tr>
<tr>
<td>Active</td>
<td>Whether the scheduled upgrade is active. If this field is not selected, the upgrade will not perform on the scheduled date and time.</td>
</tr>
<tr>
<td>Status</td>
<td>The status of the upgrade. This value is read-only. Possible statuses include:</td>
</tr>
<tr>
<td></td>
<td>• Pending</td>
</tr>
<tr>
<td></td>
<td>• Running</td>
</tr>
<tr>
<td></td>
<td>• Complete</td>
</tr>
<tr>
<td></td>
<td>• Failed</td>
</tr>
</tbody>
</table>

4. Click Submit.

After an upgrade is executed, you can review the upgrade details to learn more about it. If your upgrade failed, review the Failure Reason to determine next steps.

**Table 386: Upgrade details**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>From Version</td>
<td>The version that the server was upgraded from.</td>
</tr>
<tr>
<td>To Version</td>
<td>The version that the server was upgraded to.</td>
</tr>
<tr>
<td>Actual Start Time</td>
<td>Time that the upgrade began.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>------------------------------------------------------------------</td>
</tr>
<tr>
<td>End Time</td>
<td>Time that the upgrade ended.</td>
</tr>
<tr>
<td>Failure Reason</td>
<td>Reason that the upgrade failed.</td>
</tr>
</tbody>
</table>

Manually upgrade an Edge Encryption proxy server running on Linux

Update a proxy running on Linux.

If using AES 256-bit encryption with Java 8 update 141 (8u141) or lower, you must install the Java Cryptography Extension (JCE) jurisdiction policy files by copying them into the system Java home directory of each Edge Encryption proxy server host. Add these files to the `<Java-home-directory>/jre/lib/security` folder before performing a scheduled or manual upgrade. To install the AES 256-bit encryption policy files, see Enable AES 256-bit encryption for Java 8 update 141 (8u141) or earlier on page 1122.

Role required: security_admin or local administrator on the host machine.

1. Copy the Edge Encryption update-archive file to the installation directory.
2. Change to the installation directory.
3. Run the following command:

   ```
   java -jar edgeencryption-dist-<version>-linux-x86-64.jar -m dist-upgrade -c <proxy directory>
   ```

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>proxy directory</td>
<td>The directory in the installation directory where the proxy was initially installed. This directory is created by the install.</td>
</tr>
</tbody>
</table>

If you want to see the help screen, execute this command without arguments: `java -jar edgeencryption-dist-<version>-linux-x86-64.jar`

A new proxy directory is created with a current timestamp and the old proxy directory is maintained as a backup. The old proxy shuts down and the new proxy starts up. Any open connections/transactions on the old proxy server are terminated.

4. Check the proxy log in the new directory and the instance to verify that the new proxy is running.

Manually upgrade an Edge Encryption proxy server running on Windows

Update a proxy running on Windows.

If using AES 256-bit encryption with Java 8 update 141 (8u141) or lower, you must install the Java Cryptography Extension (JCE) jurisdiction policy files by copying them into the system Java home directory of each Edge Encryption proxy server host. Add these files to the `<Java-home-directory>/jre/lib/security` folder before performing a scheduled or manual upgrade. To install the AES 256-bit encryption policy files, see Enable AES 256-bit encryption for Java 8 update 141 (8u141) or earlier on page 1122.

Role required: security_admin or local administrator on the host machine.

1. Download the Edge Encryption proxy-update archive file to the installation directory.
2. Start the Windows cmd terminal program with administrator privileges.
3. Change to the installation directory.
4. Run the following command:

   ```
   java -jar edgeencryption-dist-<version>-windows-x86-64.jar -m dist-upgrade -c <proxy directory>
   ```
### Option Description

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>proxy directory</td>
<td>The directory in the installation directory where the proxy was initially installed. This directory is created by the install.</td>
</tr>
</tbody>
</table>

If you want to see the help screen, execute this command without arguments: `java -jar edgeencryption-dist-<version>-windows-x86-64.jar`

A new proxy directory is created with a current timestamp and the old proxy directory is maintained as a backup. The old proxy shuts down and the new proxy starts up. Any open connections/transactions on the old proxy server are terminated.

5. Check the proxy log in the new directory and the instance to verify that the proxy has been updated and is running.

---

### Roll back an Edge Encryption proxy server upgrade

If a proxy upgrade is unsuccessful, you can go back to the earlier version.

If an upgrade fails when using the scheduled upgrade feature in the London release, the proxy server will automatically roll back to the old version. The old proxy server is stored unmodified in a backup directory.

If you would like to roll back a manual upgrade, you can follow these steps.

1. Shut down the proxy.
2. Delete the new proxy directory.
3. Rename the backup directory to the proxy name.
   - The backup directory is in the proxy installation directory with the name `<proxy name>_backup`.
4. Start the proxy.
5. Check the proxy log and the instance to verify that the proxy is online.

---

### Edge Encryption configuration

After the Edge Encryption proxy server is installed and running, manage Edge Encryption through the proxy server.

You must complete all the steps in *Edge Encryption installation* on page 1102 before creating encryption configurations and encryption patterns on the instance.

**Note:** To access the Edge Encryption configuration, you must log in through the proxy server and elevate to the security_admin role.

---

### Rotate encryption keys

Perform encryption key rotation from the instance. Add a new key, change the default key assignment, and then schedule a mass key rotation job.

Before setting an encryption key as the default key, make the key available to each proxy. This ensures that the proxies have the key to encrypt data when the key is assigned as the default key. All proxies must have access to a key before that key can be assigned as the default key.
Note: Before removing a key from the proxy, set up and run a mass key rotation job to ensure that no data on the instance uses the key.

Schedule a single key rotation job

Schedule a job to find data encrypted using a specified key alias and then re-encrypt the data with the current default encryption key. The data is decrypted before it is re-encrypted with the default key.

Role required: security_admin

Before scheduling this job, update the default key in Edge Encryption Configuration Encryption Key Configuration Set Default Keys.

1. Navigate to Edge Encryption Configuration Maintenance Schedule Single Key Rotation.
2. Fill in the fields on the form as appropriate.

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a descriptive name.</td>
</tr>
<tr>
<td>Job Type</td>
<td>Select Single Key Rotation.</td>
</tr>
<tr>
<td>Key</td>
<td>Enter the key to be retired. Verify that this key is no longer the default key in Edge Encryption Configuration Encryption Key Configuration Set Default Keys.</td>
</tr>
<tr>
<td>Estimate record count</td>
<td>Total estimated number of records to process. Not available when running a single key rotation.</td>
</tr>
<tr>
<td>Process Historical Records</td>
<td>Select to process historical records in the Audit table if the field is audited. When encrypting historical records for a field in the Audit table, both new values and old values are encrypted. This field is read only and active.</td>
</tr>
<tr>
<td></td>
<td>To learn more about audited fields, see Auditing.</td>
</tr>
<tr>
<td>Estimate Maximum Audit Record Count</td>
<td>Estimated maximum number of audited records to process. Not available when running a single key rotation.</td>
</tr>
<tr>
<td>Active</td>
<td>Clear this check box if you want to deactivate this job.</td>
</tr>
<tr>
<td>Run</td>
<td>Select the period between job executions.</td>
</tr>
<tr>
<td>Starting</td>
<td>Enter the date and time to run the job for the first time.</td>
</tr>
</tbody>
</table>

3. Click the menu icon in the form header and select Save. Estimate Record Count is not supported when processing audited fields.

Schedule a mass key rotation job

Schedule a job to find data encrypted with any previous key, and then re-encrypt the data with the current default encryption keys. The data is decrypted before it is re-encrypted with the current default key.
Role required: security_admin

1. Navigate to Edge Encryption Configuration Maintenance Schedule Mass Key Rotation.
2. Fill in the fields on the form as appropriate.

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a descriptive name.</td>
</tr>
<tr>
<td>Job Type</td>
<td>Select Mass Key Rotation.</td>
</tr>
<tr>
<td>Estimate record count</td>
<td>Total estimated number of records to process. Not available when running a mass key rotation.</td>
</tr>
<tr>
<td>Process Historical Records</td>
<td>Select to process historical records in the Audit table if the field is audited. When encrypting historical records for a field in the Audit table, both new values and old values are encrypted. This field is read only and active. To learn more about audited fields, see Auditing.</td>
</tr>
<tr>
<td>Estimate Maximum Audit Record Count</td>
<td>Estimated maximum number of audited records to process. Not available when running a mass key rotation.</td>
</tr>
<tr>
<td>Active</td>
<td>Clear this check box to deactivate this job.</td>
</tr>
<tr>
<td>Run</td>
<td>Select the period between job executions.</td>
</tr>
<tr>
<td>Starting</td>
<td>Enter the date and time to run the job for the first time.</td>
</tr>
</tbody>
</table>

3. Click the menu icon in the form header and select Save.
   Estimate Record Count is not supported when processing audited fields.

Schedule an attachment key rotation job

Schedule a job to find attachments encrypted using a specified key alias, and then re-encrypt the attachments with the current default encryption key. The attachment is decrypted before it is re-encrypted with the default key.

Role required: security_admin

1. Navigate to Edge Encryption Configuration Maintenance Schedule Attachment Key Rotation.
2. Fill in the fields on the form as appropriate.

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a descriptive name.</td>
</tr>
<tr>
<td>Job Type</td>
<td>Select Attachment Key Rotation.</td>
</tr>
<tr>
<td>Active</td>
<td>Clear the check mark if you want to deactivate this job.</td>
</tr>
<tr>
<td>Table</td>
<td>Select a table.</td>
</tr>
<tr>
<td>Run</td>
<td>Select the period between job executions.</td>
</tr>
</tbody>
</table>
3. Click the menu icon in the form header and select Save.
4. To see an estimated count of records to be updated, click Estimated Record Count.
5. To run the job immediately, click Execute Now.

Encrypt fields using encryption configurations

Encrypt fields by creating encryption configurations.

To configure Edge Encryption, you must be connected to the instance through the proxy. Test all changes on a non-production instance before making the changes to the production instance.

Define encryption keys

After setting up one or more proxies and configuring a default encryption key, the instance verifies that the keys are available to all proxies. You cannot make an encryption key the default key unless all proxies have the key. Once a default key is defined, you can create encryption configurations.

Assign fields and attachments to be encrypted

Assigning fields and attachments to be encrypted means assigning an encryption type to the field or attachment. Before marking a field as encrypted, evaluate these issues.

- Determine what system features might be impacted.
- Examine all scripts for use of the field.
- Make any desired adjustments to the field's size. After a field has been configured for encryption, the field size cannot be changed.

Marking a field to be encrypted expands the field size to hold the extra space needed to store the encrypted data. The process of expanding the field size can take a long time depending on the number of records in the table.

Create an encryption configuration

Select the fields to be encrypted and identify the encryption type.

Role required: security-admin

2. Fill in the fields on the form, as appropriate.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table</td>
<td>The table containing the field to be encrypted.</td>
</tr>
<tr>
<td>Type</td>
<td>Whether to encrypt a table column or attachments for the table. Select Column.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------</td>
<td>------------------------------------------------------------------</td>
</tr>
<tr>
<td>Column</td>
<td>The table field to be encrypted.</td>
</tr>
<tr>
<td></td>
<td>This field appears when the Type is Column.</td>
</tr>
<tr>
<td>Encryption type</td>
<td>The encryption type to use.</td>
</tr>
</tbody>
</table>

**Note:** A specific table and field combination can only have one active configuration at a time.

3. Click Submit.

After the encryption record has been added, you can create an encryption job to encrypt existing data. If you do not run an encryption job, the existing data is encrypted the next time it is changed.

**Deactivate an encryption configuration**

After configuring a field or a table’s attachments to be encrypted, you can stop encryption by deactivating the encryption configuration. After deactivating encryption, you can run a Decryption job for fields or an Attachment Decryption job for attachments to remove the encrypted data from the instance.

Role required: security-admin

**Warning:** Deactivating an encryption configuration does not delete the encryption record and the encryption type cannot be changed.

1. Navigate to Edge Encryption Configuration Edge Encryption Configurations All. The Edge Encryption Configurations list is shown.
2. Click on the encryption configuration to be deactivated. The Edge Encryption Configuration form is shown.
3. Click on the Active box. The Active box is clear.
4. Click Update. The Edge Encryption Configurations list is shown.

You can run a Decryption or Attachment Decryption job to decrypt data on the instance. If you do not run a job, the encrypted data is decrypted the next time it is changed.

**Schedule an encryption job**

You can schedule a job to find and encrypt any unencrypted data in a specified field, using the default encryption key configured for the field. If you do not create an encryption job after configuring a field for encryption, only new values are encrypted.

Role required: security-admin

1. Navigate to Edge Encryption Configuration Encryption Configurations All.
2. Click the field that you want to schedule an encryption job for.
3. Under Related Links, click Schedule Mass Encryption Job. The Scheduled Encryption Job form is shown with all fields populated. The bottom of the form shows records for any previous job executions.
4. Fill in the fields on the form, as appropriate.
<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>Clear this check box if you want to deactivate this job.</td>
</tr>
<tr>
<td>Job Type</td>
<td>Select Encryption.</td>
</tr>
<tr>
<td>Table</td>
<td>Select a table.</td>
</tr>
<tr>
<td>Column</td>
<td>Select a column.</td>
</tr>
<tr>
<td>Estimated record count</td>
<td>Total estimated number of records to process. Populates after selecting Estimate Record Count.</td>
</tr>
<tr>
<td>Process Historical Records</td>
<td>Select to process historical records in the Audit table if the field is audited. When encrypting historical records for a field in the Audit table, both new values and old values are encrypted. To learn more about audited fields, see Auditing.</td>
</tr>
<tr>
<td>Estimate Maximum Audit Record Count</td>
<td>Estimated maximum number of audited records to process. Populates after selecting Estimate Record Count. This field is only visible when Process Historical Records is selected.</td>
</tr>
<tr>
<td>Run</td>
<td>Select the period between job executions.</td>
</tr>
<tr>
<td>Starting</td>
<td>Enter the date and time to run the job for the first time.</td>
</tr>
</tbody>
</table>

5. Click the menu icon in the form header and select Save.
6. To see an estimated count of records to be updated, click Estimate Record Count.
7. To run the job immediately, click Execute Now.

**Schedule a decryption job**

You can schedule a job to decrypt data in an encrypted field, to store clear data in the instance.

**Note:** You must mark the encryption record for the field as inactive (clear the Active box) in order to run the decryption job.

Role required: security-admin

1. Navigate to Edge Encryption Configuration Encryption Configurations All.
2. Click the field that you want to decrypt.

The Scheduled Encryption Job form is shown with all fields populated. The bottom of the form shows records for previous job executions.
4. Fill in the fields on the form, as appropriate.

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a descriptive name.</td>
</tr>
<tr>
<td>Job Type</td>
<td>Select Decryption.</td>
</tr>
<tr>
<td>Active</td>
<td>Clear this check box if you want to deactivate this job.</td>
</tr>
<tr>
<td>Table</td>
<td>Select a table.</td>
</tr>
<tr>
<td>Column</td>
<td>Select a column.</td>
</tr>
<tr>
<td>Estimated record count</td>
<td>Total estimated number of records to process. Populates after selecting Estimate Record Count.</td>
</tr>
<tr>
<td>Process Historical Records</td>
<td>Select to process historical records in the Audit table if the field is audited. When encrypting historical records for a field in the Audit table, both new values and old values are encrypted. To learn more about audited fields, see Auditing.</td>
</tr>
<tr>
<td>Estimate Maximum Audit Record Count</td>
<td>Estimated maximum number of audited records to process. Populates after selecting Estimate Record Count. This field is only visible when Process Historical Records is selected.</td>
</tr>
<tr>
<td>Run</td>
<td>Select the period between job executions.</td>
</tr>
<tr>
<td>Starting</td>
<td>Enter the date and time to run the job for the first time.</td>
</tr>
</tbody>
</table>

5. Click the menu icon in the form header and select Save.
6. To see an estimated count of records to be updated, click Estimate Record Count.
7. To run the job immediately, click Execute Now.

Encrypt attachments using standard encryption

You can encrypt attachments for specific tables.

All attachments to a table use the same encryption type. Encrypted attachments are not searched when performing a text search. Only the standard encryption types are allowed for attachments. The order preserving or equality preserving encryption types are not allowed.

For a session bypassing the Edge Encryption proxy:
- On a record with attachment encryption activated:
• The user can see that there are attachments and the attachment names.
• The user cannot open or download the attachments.
• The user cannot add new attachments.

• On a record without attachment encryption activated:
  • The user can open and download existing attachments.
  • The user can add new attachments.

For a session using the encryption proxy, the user can open and download existing attachments and add new attachments.

Configure attachment encryption

Select the tables whose attachments are to be encrypted and identify the encryption type.

Role required: security-admin

2. Fill in the fields on the form, as appropriate.

<table>
<thead>
<tr>
<th>Table 388: Edge Encryption configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Field</strong></td>
</tr>
<tr>
<td>Table</td>
</tr>
<tr>
<td>Type</td>
</tr>
<tr>
<td>Column</td>
</tr>
<tr>
<td>Encryption type</td>
</tr>
</tbody>
</table>

3. Click Submit.

After the encryption record has been added, you can create an attachment encryption job to encrypt existing attachments. If you do not run an attachment encryption job, the system encrypts new attachments when you attach them.

Schedule an attachment encryption job

You can schedule a job to find and encrypt any unencrypted attachments for a specified table, using the default encryption key configured for the table.

Role required: security-admin

1. Navigate to Edge Encryption Configuration Encryption Configurations All .
2. Click the table you want to schedule an encryption job for.
The Scheduled Encryption Job form is shown with all fields populated. The bottom of the form shows records for previous job executions.

4. Fill in the fields on the form, as appropriate.

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a descriptive name.</td>
</tr>
<tr>
<td>Active</td>
<td>Clear this check box if you want to deactivate this job.</td>
</tr>
<tr>
<td>Job Type</td>
<td>Select Attachment Encryption.</td>
</tr>
<tr>
<td>Table</td>
<td>Select a table.</td>
</tr>
<tr>
<td>Run</td>
<td>Select the period between job executions.</td>
</tr>
<tr>
<td>Starting</td>
<td>Enter the date and time to run the job for the first time.</td>
</tr>
</tbody>
</table>

5. Click the menu icon in the form header and select Save.

6. To see an estimated count of records to be updated, click Estimate Record Count.

7. To run the job immediately, click Execute Now.

Schedule an attachment decryption job

You can schedule a job to decrypt any encrypted attachments for a specified table, to store clear attachments in the instance.

**Note:** You must mark the encryption record for the table as inactive (clear the Active box) before the decryption job runs, otherwise, nothing happens.

Role required: security-admin

1. Navigate to Edge Encryption Configuration Encryption Configurations All.
2. Click the table with the attachments that you want to decrypt.

The Scheduled Encryption Job form is shown with all fields populated. The bottom of the form shows records for previous job executions.

4. Fill in the fields on the form, as appropriate.

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a descriptive name.</td>
</tr>
<tr>
<td>Job Type</td>
<td>Select Attachment Decryption.</td>
</tr>
<tr>
<td>Active</td>
<td>Clear the check mark if you want to deactivate this job.</td>
</tr>
<tr>
<td>Table</td>
<td>Select a table.</td>
</tr>
<tr>
<td>Run</td>
<td>Select the period between job executions.</td>
</tr>
<tr>
<td>Starting</td>
<td>Enter the date and time to run the job for the first time.</td>
</tr>
</tbody>
</table>

5. Click the menu icon in the form header and select Save.
6. To see an estimated count of records to be updated, click Estimate Record Count.
7. To run the job immediately, click Execute Now.

Change a field or attachment's encryption type

You can change a field or attachment's encryption type by selecting a new encryption type in the existing encryption configuration record. A specific table and field combination can only have one active configuration at a time.

Role required: security_admin
1. Navigate to Edge Encryption Configuration Encryption Configurations All. The Edge Encryption Configurations list is shown.
2. Open the record for the encryption configuration to be changed.
3. Click the Encryption type dropdown and select a new encryption type.

Note: For attachments, only Standard AES128 and Standard AES256 are allowed.

4. If needed, run an encryption or attachment encryption job.

   It is not necessary to run an encryption job. If you do not run an encryption job, the field or attachment is encrypted using the new encryption type the next time the field or attachment is changed.

Tokenize strings using encryption patterns

You can replace string patterns with tokens before they are sent to and stored in the instance.

To use encryption patterns, you must install and set up a MySQL database in your network. This is the same database used for order-preserving encryption. To create or edit encryption patterns, you must be connected to the instance through the proxy.

Role required: security-admin

You can use base system patterns, or create your own patterns. Base system patterns are advanced patterns. Encryption patterns include the following limitations.

- A pattern of all alpha characters is not allowed.
- The minimum pattern size is five characters. You can change this setting using a system property.
- The * and + quantifiers are forbidden in encryption patterns.
- Encryption patterns match complete words, not parts of strings embedded in a larger string. Words are defined by spaces and characters not available for inclusion in a pattern.
- If the same string is sent to the instance multiple times, it is replaced with the same token.
- Text search on exact matches is supported. The query string is exchanged with a token when sent to the instance, the search is performed on tokens, and when the search results are returned to the proxy server, the tokens are replaced with the clear text. Features such as stemming are not supported.

When using patterns, the clear text never leaves your network. When the proxy server matches a pattern in a request going to the instance, the proxy replaces the string with a token of the same size. The token is sent to instance instead of the clear text string. When the response is sent from the instance to the proxy server, the proxy replaces the token with the string. When viewed through the proxy server, the string displays as clear text.

Note: Encrypted fields are not checked for encryption patterns.

1. Navigate to Edge Encryption Configuration Encryption Patterns Create New. Alternatively, you can navigate to Advanced Patterns to activate or edit a preconfigured pattern.
2. Enter the pattern name.
3. Define the Edge pattern input type.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic</td>
<td>A series of character types. In the Basic Pattern Input tab, click Add and select a character type. The Sample pattern displays the pattern as characters are added. Click New Block to move the next character to the next line. This enables you to group characters in a long pattern. Click X to delete the last character in the pattern.</td>
</tr>
<tr>
<td>Advanced</td>
<td>A Java RegEx expression. If advanced is selected, you cannot change the input type back to basic. In the Sample match field, enter a sample pattern to test the RegEx expression. In the Pattern field, enter a Java RegEx expression. Click Validate to verify that the expression matches the sample pattern.</td>
</tr>
</tbody>
</table>

The input type defines how you are going to enter the pattern. It does not impact how the pattern is used.

4. Click Submit.

Repair or recover order-preserving encrypted data

If you have the security-admin role, you can schedule jobs performed by the Edge Encryption proxy to repair or recover fields that use order preserving encryption.

You can schedule jobs to:
• Repair order tokens.
• Recreate the proxy database.

Running these jobs can be a time-consuming operation which might impact the performance of the Edge Encryption proxy. Schedule these jobs at a time when no users or a minimum set of users are using the system, such as midnight on the weekend.

Schedule an order token repair job

You can schedule a job to find and repair fields where the order token is missing.

Role required: security-admin

Use these jobs to repair individual fields in a table or to repair all fields using order preserving encryption. Run this job when the proxy database has been offline while the instance has been running, which results in order preserving fields that are missing order tokens.

1. Navigate to Edge Encryption Configuration Maintenance Schedule Order Token Repair.
2. Fill in the fields on the form, as appropriate.
### Schedule a proxy-database recovery job

Run this job when the proxy database has lost data. This job finds all records that have been encrypted with a token (order preserving encryption type) and sends them to the proxy so that the proxy database can be rebuilt.

**Role required:** security-admin

1. Navigate to **Edge Encryption Configuration Maintenance Schedule Database Recovery**.
2. Fill in the fields on the form, as appropriate.

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a descriptive name for this job.</td>
</tr>
<tr>
<td>Job Type</td>
<td>Select Database Recovery.</td>
</tr>
<tr>
<td>Active</td>
<td>Clear this check box if you want to deactivate this job.</td>
</tr>
<tr>
<td>Run</td>
<td>Select the period between job executions.</td>
</tr>
<tr>
<td>Starting</td>
<td>Enter the date and time to run this job for the first time.</td>
</tr>
</tbody>
</table>

3. Click the menu icon in the form header and select Save.
4. To see an estimated count of records to be updated, click Estimate Record Count.

### Blacklist requests from an IP address in your network

Because the Edge Encryption proxy server resides in your network, it may be subject to vulnerability scans by your network software. To prevent IP scanner or other requests from being forwarded to your ServiceNow instance, you can blacklist IP addresses, IP ranges, or network masks. Any connection to the proxy server from a blacklisted address is terminated and is not forwarded to your instance.

**Role required:** security_admin
To blacklist an IP address, you must be logged in to your instance through the proxy server.

**Important:** Ensure that you understand your network topology before blacklisting IP addresses in your network. If an IP address is added to the blacklist, any user with that IP address will be blocked from accessing the Edge Encryption proxy server.

1. Navigate to **Edge Encryption Configuration** > **Maintenance** > **Blacklist IP Addresses**. The Encryption Proxy IP Blacklists [edge_encryption_ip_blacklist] list view opens.
2. Click **New**.
3. Complete the form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proxy server</td>
<td>The Edge Encryption proxy server that is prevented from forwarding requests from blacklisted addresses.</td>
</tr>
</tbody>
</table>
| IP, IP range, or net-mask | Requests from this IP address, range, or network mask are not forwarded to your ServiceNow instance. Example values include:  
  • IP address: 10.10.10.5  
  • IP range: 10.10.10.1-15  
  • Network mask: 10.10.10.0/24 |
| Active             | Whether the record is active. Only IP addresses from active records are prevented from sending requests to the instance. |
| Description        | Description of the blacklist record. |

4. Click **Submit**.
5. Repeat these steps for all other proxies for which an IP address should be blacklisted.

The Edge Encryption proxy server terminates any connection from a blacklisted IP addresses, range, or network mask and cannot forward the request to the instance.

**Encrypt data from a record producer**

Record producers allow end users to create task-based records, such as incident records, from the Service Catalog and Service Portal. If a record producer attempts to insert data into a field marked for encryption, an invalid insert message displays and the data is not saved to the field. To configure your Edge Encryption proxy server to allow inserts from a record producer, create encryption rules from the record producer record.

Role required: security_admin

Encrypting data from a record producer requires an encryption configuration defined for the target field. Check that you have created an encryption configuration for the target field and table before creating an encryption rule from a record producer. See **Create an encryption configuration** on page 1155. To encrypt attachments from a record producer, **Configure attachment encryption** on page 1159.

1. Log in to your instance through the Edge Encryption proxy server.
2. Navigate to **Service Catalog** > **Catalog Definitions** > **Record Producers**.
3. **Create a record producer** record or open an existing record producer record.

  Two inactive encryption rules are automatically created to encrypt data sent from the record producer to the field marked for encryption.
5. Activate the necessary encryption rules created by the record producer.
   a) Navigate to Edge Encryption Configuration Rules All.
   b) Depending on where the record producer will be used, open the associated encryption rule created by the record producer and select the Active flag.
      If using the record producer in the Service Catalog, activate the `<RecordProducerName>` encryption rule. If using the record producer in the Service Portal, activate the `<RecordProducerName>Json` encryption rule.

6. Examine the Encryption rule Action field and add any necessary field names or statements.

   If a record producer directly maps a variable to a field in a table, the encryption rule automatically maps the variable to the correct field. However, if a variable is indirectly mapped through various scripts on the platform, you may need to update the rules to map each variable to the correct field.

   The below encryption rule was created from the Report Outage record producer and processes POST parameters from the Service Catalog to map variables to fields in the instance. Replace 'FILL ME IN' with the target field.
The below encryption rule was created from the Report Outage record producer and processes a JSON payload from the Service Portal to map variables to fields in the instance. Add additional statements to map any scripted variables to the target fields.
```javascript
// Function ReportOutageAction(request) {
var tableName = 'incident';

// Some fields are set in script, additional parameter lines may need to be added

// current.comments is accessed via script from notes; // assignment to current.comments does NOT replace existing values
// current.short_description is accessed via script from short_description;
// current.description is accessed via script from current.short_description;
// current cages are accessed via script from getcage();
// var isoContent = request.getParameter('isoContent');
// for (var isoContentAttr = isoContent.getAttributes('variables')['next']);
// isoContentAttr.hasNext();
// isoContentAttr.next();
// isoContentAttr.getValue(tableName, isoContentAttr.getName());
```
When the payload from the record producer is examined, the error_message element contains the value for the short_description field. By adding the following statement, you can map the scripted variable error_message to the short_description field.

```javascript
if (jsonElement.getName() == 'error_message')
    jsonElement.valueFor(tableName, 'short_description');
```

The value of the Action field becomes:

```javascript
function ReportOutageJsonAction(request) {
    var tableName = 'incident';
    // Some fields are set in script, additional parameter lines may need to be added
    // current.comments is accessed via script from notes; // assignment to current.comments does NOT replace existing values
    // current.short_description is accessed via script from short_description;
    // current.description is accessed via script from current.short_description;
    // current.caller_id is accessed via script from gs.getUserID();
    var jsonContent = request.getAsJsonContent();
    for (var jsonElementItr = jsonContent.getIterator('variables'); jsonElementItr.hasNext();)
        {  
            var jsonElement = jsonElementItr.next();
            if (jsonElement.getName() == 'error_message')
                jsonElement.valueFor(tableName, 'short_description');
            else {
                jsonElement.valueFor(tableName, jsonElement.getName());
            }
        }
}
```

The two encryption rules enable the record producer to insert values into fields marked for encryption from either the Service Catalog or Service Portal.

Define a custom encryption rule

It may be necessary to identify and encrypt sensitive information in HTTP requests on the way to your instance. You can write encryption rules to identify, interpret, and encrypt data in such requests, mapping fields in the request to table-field names on your instance.

What is an encryption rule

Encryption rules are scripts executed on the Edge Encryption proxy server to map fields in a request to fields in a table on your ServiceNow instance. An encryption rule tells the Edge Encryption proxy server how to encrypt data in custom payloads.

**Note:** Encryption rules only support ECMAScript 3 and below.

When to use custom rules

A set of encryption rules is included as part of the Edge Encryption plugin. These rules handle core platform use cases such as editing a field from the list edit form, updating a record from the record form, managing direct web services, and processing data from the REST API. Applications created using standard forms and lists should work without custom encryption rules.
If you develop scripted processors, scripted web services, scripted REST APIs, UIs, or Ajax scripts that contain data that should be encrypted, you must write encryption rules to find and map the data to Glide table-field names.

**Format of an encryption rule**

Rules include three parts:

- **Condition**: Identifies the type of request.
- **Action**: Maps fields in the request to fields in a table, encrypting values that map to fields with encryption configurations defined.
- **Order**: Priority of the rule. The lowest priority rule with a satisfied condition is the only rule that runs. Like business rules, rules run from lowest to highest.

Except for attachment requests, when an HTTP request hits the Edge Encryption proxy server, the Edge Encryption proxy server evaluates all encryption rule conditions in priority order until either all conditions return false, or one condition returns true. When a condition returns true, the action is executed on the request and the result is forwarded to the instance. No other conditions are evaluated. As a result, encryption rule conditions should be as specific as possible. A generic rule might evaluate as true for a request meant to be processed by another rule, causing the request to be processed by the wrong action. If a generic condition is unavoidable, the rule should be marked with a high-order value so that more specific rules are evaluated first.

**Guidelines for creating encryption rules**

Creating efficient, optimized encryption rules can reduce processing time for script validation.

Overall guideline: When rules get very long, do your best to minimize the number of blocks and break the rules apart whenever possible. Ideally, custom rules should apply to specific use cases, rather than encompassing several cases, with ifs or switch statements in the action script.

1. **Split rules whenever possible.** For example,
   - Create different rules for different tables and ensure that each rule runs only on its respective table.
   - Create different rules for each record producer you are targeting, or at least for each subset of record producers. Instead of one rule targeting dozens of sys_ids, you could create several different rules targeting smaller subsets of record producers, or even create one rule per sys_id.

   **Note:** Creating multiple rules requires more maintenance. The trade-off is that multiple, simpler rules can be validated more efficiently than longer, more complex rules.

2. **Minimize the number of blocks.** Because the processing engine scans each block while evaluating scripts, a large number of blocks causes delays in validation. For example,
   - Replace all if blocks with an array lookup, and replace all blocks in the array lookup with just one if block.
   - Combine if blocks whenever it is possible to group them.
Encryption rule APIs

Encryption rules are written in JavaScript and utilize Edge Encryption APIs to locate and encrypt sensitive information in the body of a request. The API uses expressions similar to xPath to navigate through both JSON and XML content.

Edge Encryption APIs process the request off the stream as it is being written to the output stream. Stream parsing allows encryption rules to be network performant. However, fetching and parsing content from the body multiple times could lead to unexpected results. To account for this, requests should be processed by the action in a single pass.

When creating encryption rules, you cannot use Glide APIs, script includes, business rules, or any global parameters such as current. Because the rules are created for HTTP objects, a global request object is available.

When creating encryption rules, you cannot use APIs from the white list manager or scoped applications.

Error handling

If an encryption rule condition or action throws an exception, check the proxy log for troubleshooting information.

Inspect the client request

Before creating a custom encryption rule, you must determine the format of the client request entering the Edge Encryption proxy server.

Because encryption rules iterate over client requests and determine what, if anything, needs to be encrypted, you must understand the type of request you are creating a rule for. The format of the client request determines the structure of your encryption rule and the APIs available for use in the rule.

1. Inspect the client request.

   Depending on the source of the request, the following tools are available to inspect the request and determine the format.

<table>
<thead>
<tr>
<th>Source of request</th>
<th>Available tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client browser</td>
<td>Use the developer console in your browser to inspect the client request. Useful tools include:</td>
</tr>
<tr>
<td></td>
<td>• Firefox Network Monitor</td>
</tr>
<tr>
<td></td>
<td>• Chrome Network Panel</td>
</tr>
<tr>
<td>Third-party/external source</td>
<td>Use an HTTP protocol analyzer to inspect the request. Useful tools include:</td>
</tr>
<tr>
<td></td>
<td>• Wireshark</td>
</tr>
<tr>
<td></td>
<td>• HTTP Scoop</td>
</tr>
<tr>
<td></td>
<td>Alternatively, you can often use documentation for the external source to</td>
</tr>
<tr>
<td></td>
<td>determine the format of the request.</td>
</tr>
</tbody>
</table>

2. From the client request, inspect the packet and determine:

   • The client request method
• The URL path of the request
• The URL parameters
• The POST parameters, if any
• The format of the request body, if included

Inspecting the request provides an understanding of the fields you need to filter for and iterate over in your encryption rule. To understand the fields in the request object, see request on page 1173.

Create an encryption rule

Encryption rules are used by the proxy to find content in HTTP requests that should be encrypted.

Role required: security_admin

Before creating an encryption rule, you must Inspect the client request on page 1170 to determine the format.

To create or edit encryption rules, you must be connected to the instance through an encryption proxy.

1. Navigate to Edge Encryption Configuration Rules Create New.
2. In the Name box, enter a name.
3. In the Request Type, select an HTTP method.
   - HTTP Post
   - HTTP Get
   - HTTP Put
   - HTTP Patch
   - HTTP Delete

   Note: Pre-Jakarta instances only allow HTTP Get and HTTP Post methods.

4. In the Condition box, enter a JavaScript statement defining when the rule should run.
5. In the Action box, enter a JavaScript function to be executed when the condition is true.
6. In the Order box, enter the relative priority of the rule.
7. Click Submit, or save the form.

Encryption rule conditions

Encryption rule conditions determine if the rule should be executed.

An encryption rule condition must return true if the rule is to handle the HTTP request; otherwise, it must return false.
As you build your condition, keep in mind that only one rule is executed per request. As a result, the condition must be as general or specific as needed to run under the intended circumstances.

**Note:** Be careful when performing checks on content in the condition. Excessive checks can be expensive for the proxy server and may cause increased latency when handling complex requests.

The condition can use the method type, content type, URL path, or any URL query string parameters to determine if the rule should handle the request. The condition has access to these fields via the `request` object. Be sure that, prior to creating an encryption rule condition, you have inspected the client request and understand the conditions needed to trigger the rule.

**Note:** To build efficient rules, consider easy ways to rule out requests that you do not want to be evaluated by a rule. Build your condition to return false for those requests first. This method increases performance and quickly routes the request to the correct rule faster.

*Encryption rule objects and APIs* on page 1173 are available to encryption rule conditions.

### Example using path and postParams

/* This condition checks if the request coming in has a path ending in "/sample_processor.do" and if a post parameter exists in that request called myPostParam */

```javascript
function SampleCondition(request) {
  if (endsWith(request.path, "/sample_processor.do") &&
      request.postParams.myPostParam) {
    return true;
  }
  return false;
}
```

### Example using urlParams and contentType

/* This condition checks if a url parameter exists in the query called myUrlParam and if the content type contains 'xml' (if so, you can expect the body to be an XML payload). Then, it checks if the xml payload contains myXmlTag */

```javascript
function SampleCondition2(request) {
  if (request.urlParams.myUrlParam &&
      request.contentType.indexOf('xml') > -1 &&
      request.xmlContains('myXmlTag')) {
    return true;
  }
  return false;
}
```

### Encryption rule actions

An encryption rule maps fields in a client request to fields in a table on your instance and identifies fields marked for encryption.

An encryption rule action only runs when the encryption rule condition returns true. An encryption rule identifies the data to be encrypted in your request payload. Because the rule iterates over the content in the request object, you must understand the form and structure of your request body and determine what in the request needs to be encrypted. The data to be encrypted might be located within:

- A **POST or URL parameter**.
- JSON or XML content within a **POST or URL parameter**.
- A **JSON** payload.
- An **XML** payload.

Before writing an encryption rule action, be sure to:

- *Inspect the client request* on page 1170.
- Identify where the sensitive data is located in the *request* object.
- Determine the field and table name to insert data into, or understand how to *dynamically pull this from the request*.

*Encryption rule objects and APIs* on page 1173 are available to encryption rule actions and conditions.

**Encryption rule objects and APIs**

Use encryption rule APIs to parse and encrypt values in requests moving through the Edge Encryption proxy server to the instance.

The APIs available for your encryption rule depend on the format of the request object. For example, if the *contentType* parameter of the request object is XML, you can use the *XML APIs* on page 1179 to parse and encrypt values in the payload. After you determine the type of object in your request, you can build an encryption rule using the available APIs.

Encryption rule APIs are available in both encryption rule condition and action scripts.

*request*

The request object is a global object available in Edge Encryption rule action and condition scripts.

The request object is a JavaScript object that represents the client request coming in to the Edge Encryption proxy server. You must build your encryption rule to parse the request object, map request object values to fields in a table on the instance, and encrypt any sensitive data in the request object.

The request object includes the following attributes and data from the client request:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>path</td>
<td>The path portion of the URL.</td>
</tr>
<tr>
<td>requestMethod</td>
<td>GET, POST, PUT, PATCH, DELETE.</td>
</tr>
<tr>
<td>contentType</td>
<td>The Content-Type header field.</td>
</tr>
<tr>
<td>urlParams</td>
<td>The parameters in the query string. This can also be evaluated to a String.</td>
</tr>
<tr>
<td>postParams</td>
<td>If this is a form post, this contains the post parameters.</td>
</tr>
</tbody>
</table>

*request - getAsJsonContent()*

Returns the request as an iterable object of type JsonNode.

This method is available only in an Edge Encryption rule if the request body is a valid JSON payload. If you are not sure what format the request body includes, check the *contentType* field on the request object.

Once the request is returned as a JsonNode object, you can use the *JSON APIs* on page 1185 to iterate over the object and encrypt fields.
Table 390: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 391: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>JsonNode</td>
<td>The request as an iterable JsonNode.</td>
</tr>
</tbody>
</table>

request - getAsXmlContent()

Returns the request content as an iterable object of type XMLContent.

This method is available only in an Edge Encryption rule if the request body is a valid XML payload. If you are not sure what format the request body includes, check the contentType field on the request object.

Once the request is returned as an XMLContent object, you can use the *XML APIs* on page 1179 to iterate over the object and encrypt fields.

Table 392: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 393: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>XMLContent</td>
<td>The request as an iterable object of type XMLContent.</td>
</tr>
</tbody>
</table>

request - XMLContains(String path)

Returns true if the given path exists in the XML DOM.

This method is available only if the request body is a valid XML payload. If you are not sure what format the request body includes, check the contentType field on the request object.

Table 394: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>path</td>
<td>String</td>
<td>XPath statement you are searching for.</td>
</tr>
</tbody>
</table>

Table 395: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boolean</td>
<td>Whether the given path exists in the XML DOM.</td>
</tr>
</tbody>
</table>
POST and URL parameter APIs

POST and URL parameters can be accessed as properties of the request object using request.postParams and request.urlParams.

Any single parameter can be accessed as a property of the postParams and urlParams parent objects by calling request.postParams.myParam. Any parameter accessed this way is an object of the underlying class ParameterValue. Any APIs in this class can be called on any parameter.

After inspecting the client request, it may be necessary to access and encrypt parameter values from the request object. Depending on the data in the client request, you can encrypt values and map them to fields on the instance in multiple ways.

Encrypt the value of a known table and field

If you know the name of the instance table and field that will hold the encrypted data, you can explicitly define them in the encryption rule. For example, you may know that the request will be processed on the instance to create an incident and you want to encrypt the text parameter in the description field. In this case, you can create the following action.

```javascript
function SampleAction1() {
    request.postParams.text.valueFor('incident', 'description');
}
```

Encrypt the value of a dynamically defined table and field

If, conversely, you do not know the name of the field that the encrypted data will populate, you can dynamically define them using tableName and fieldName.

The below example processes a generic request that might store data in different task tables (such as incident, problem, and change_request) on the instance.

```javascript
function SampleAction2() {
    var tableName = request.urlParams.table;
    for (var parameter in request.postParams) {
        var currentParam = request.postParams[parameter];
        var fieldName = currentParam.toString();
        if (fieldName == 'text') {
            currentParam.valueFor(tableName, 'description')
        } else {
            currentParam.valueFor(tableName, fieldName);
        }
    }
}
```

This action:

- Gets the destination table from the URL parameters.
- Iterates over the URL parameters.
- Asks the Edge Encryption proxy server to encrypt any URL parameter with a name that matches a field marked for encryption.
- Looks for a specific parameter called text and asks the Edge Encryption proxy to encrypt the value based on the encryption configuration for the description field on the incident table.

In this example, the valueFor() method is not actually performing any encryption. Rather, the method asks the Edge Encryption proxy server to check whether the table/field pair in the request object is marked for encryption with an encryption configuration and, if applicable, encrypt it.
Encrypt JSON or XML within a parameter

A POST or URL parameter might include JSON or XML content. In this case, you can process the content within the parameter, iterate over the values, and encrypt required fields. In this example, the tableName is still accessed from a POST parameter, but the value of the field is the JSON object data.

```javascript
function SampleAction3() {
    var tableName = request.postParams.table;
    var data = request.postParams.data;
    var dataIterator = data.getAsJsonContent().iterator();
    while (dataIterator.hasNext()) {
        var jsonElement = dataIterator.next();
        var fieldName = jsonElement.getName();
        if (fieldName == 'text') {
            jsonElement.valueFor(tableName, 'description');
        } else {
            jsonElement.valueFor(tableName, fieldName);
        }
    }
}
```

An example of an encryption rule action that processes XML within a POST parameter.

```javascript
function SampleAction4() {
    var tableName = request.postParams.table;
    var data = request.postParams.data;
    var dataIterator = data.getAsXmlContent().getIteratorOverAllChildren();
    while (dataIterator.hasNext()) {
        var jsonElement = dataIterator.next();
        var fieldName = jsonElement.getName();
        if (fieldName == 'text') {
            jsonElement.valueFor(tableName, 'description');
        } else {
            jsonElement.valueFor(tableName, fieldName);
        }
    }
}
```

Encrypt a query

You might encounter an encoded query within a parameter in the client request that contains sensitive data. To match a field in a query to an encrypted value in the instance database, you must create an encryption rule that asks the proxy to check whether a field in the query is marked for encryption. The `encodedQueryFor()` method parses an encoded query on a given table, and checks if any fields in the query have encryption configurations.

In this example, the rule iterates over the parameters looking for the filter parameter, which is expected to be a Glide encoded query.

```javascript
function SampleAction5() {
    var tableName = request.urlParams.table;
    for (var parameter in request.postParams) {
        var currentParam = request.postParams[parameter];
        var fieldName = currentParam.toString();
        if (fieldName == 'filter') {
            currentParam.encodedQueryFor(tableName);
        } else {
            currentParam.valueFor(tableName, fieldName);
        }
    }
}
```
For example, if the value of filter is: short_description=My sensitive information^number=INC000056^category=Outage, the query would become
short_description=<Encrypted(My sensitive information)>^number=INC000056^category=Outage on the instance.

ParameterValue - toString()
Converts the POST or URL parameter value to a string.

<table>
<thead>
<tr>
<th>Table 396: Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 397: Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>String</td>
</tr>
</tbody>
</table>

ParameterValue - getAsJsonContent()
Returns the request as an iterable object of type JsonNode.
This method is available only in an Edge Encryption rule if the request body is a valid JSON payload. If you are not sure what format the request body includes, check the contentType field on the request object.
Once the request is returned as a JsonNode object, you can use the JSON APIs on page 1185 to iterate over the object and encrypt fields.

<table>
<thead>
<tr>
<th>Table 398: Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 399: Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>JsonNode</td>
</tr>
</tbody>
</table>

ParameterValue - getAsXmlContent()
Returns the request content as an iterable object of type XMLContent.
This method is available only in an Edge Encryption rule. This method assumes that the request body is a valid XML payload. You can check the contentType to make sure.
Once the request is returned as an XMLContent object, you can use the XML APIs on page 1179 to iterate over the object and encrypt fields.
Table 400: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 401: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>XMLContent</td>
<td>The request as an iterable object of type XMLContent.</td>
</tr>
</tbody>
</table>

ParameterValue - encodedQueryFor(String tableName)

Specifies that the value of the element is an encoded query on the specified table.

Calling this function on a parameter tells the proxy that the value of the parameter is an *encoded query* for the specified table. The proxy parses the encoded query and encrypts the fields in the encoded query that must be encrypted.

Table 402: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>tableName</td>
<td>String</td>
<td>The table that you expect the query to run on.</td>
</tr>
</tbody>
</table>

Table 403: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></td>
</tr>
</tbody>
</table>

ParameterValue - valueFor(String tableName, String fieldName)

Specifies that the value of the element maps to the specified field in the specified table.

Calling this method on an element value tells the proxy that the value for this element maps to the specified field in the specified table. The proxy then checks if the field must be encrypted.

Table 404: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>tableName</td>
<td>String</td>
<td>The table name.</td>
</tr>
<tr>
<td>fieldName</td>
<td>String</td>
<td>The field name.</td>
</tr>
</tbody>
</table>

Table 405: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></td>
</tr>
</tbody>
</table>
XML APIs
XML APIs can be used after calling getAsXmlContent() on either the request object or a ParameterValue property.

When using XML APIs to write your encryption rule, you can follow a general format:

1. Call getAsXmlContent() on the request object or ParameterValue property. This returns an iterable object of the XMLContent underlying class.
2. Call getIterator() or getIterator(String xPath) on the XMLContent object. This returns an XMLElementIterator object that can be used to iterate over XML elements.
3. Call the hasNext() method on the XMLElementIterator object to determine whether another element is available.
4. Call next() on the XMLElementIterator object to return the next XML element. You cannot call next() without first calling hasNext().
5. Call valueFor(String tableName, String fieldName) on the XML element. This method tells the proxy that the value for this element maps to the specified field in the specified table. The proxy then checks if the field must be encrypted.

**Note:** To determine if you want to call valueFor(String tableName, String fieldName) on an XML element, you can use the getName() method to return the name of the element.

Mapping to a known table-field on the instance

In this example, the XML payload will be processed on the instance to insert records in the incident table. The description field will populate short_description on the incident.

```xml
<data>
  <record>
    <name>'Test Record 1'</name>
    <description>'Test Record 1 Description'</description>
    <tag>critical</tag>
  </record>
  <record>
    <name>'Test Record 2'</name>
    <description>'Test Record 2 Description'</description>
    <tag>security</tag>
  </record>
</data>
```

The following encryption rule action can apply:

```javascript
function sampleXmlAction1() {
  var xmlContent = request.getAsXmlContent();
  // This loop iterates over all description tags that match the given path
  var xmlElementIterator = xmlContent.getIterator('data/record/description');
  while (xmlElementIterator.hasNext()) {
    var xmlElement = xmlElementIterator.next();
    xmlElement.valueFor('incident', 'short_description');
  }
}
```

This action iterates through the description tags and asks the proxy server to encrypt the values and insert them into incident.short_description on the instance.
**Mapping to an unknown table-field on the instance**

In this example, the rule iterates over the record tags, but does not know what tags to expect within the record tag. The only known is that the tags within the record tags match the names of the columns specified in the table URL parameter.

The rule also specifies that, if the table is incident, then the data in the description tag should be encrypted and stored in the short_description field on the instance.

```javascript
function sampleXmlAction2() {
    var xmlContent = request.getAsXmlContent();
    var tableName = request.urlParam.table;
    // This first iterator will iterate over all record elements
    var xmlElementIterator = xmlContent.getIterator('data/record');
    while (xmlElementIterator.hasNext()) {
        encryptFieldsInRecord(xmlElementIterator.next());
    }
}
function encryptFieldsInRecord(xmlElement) {
    // Then, iterate over all tags representing fields in the table
    var fieldIterator = xmlElement.getIteratorOverAllChildren();
    while (fieldIterator.hasNext()) {
        var field = fieldIterator.next();
        var fieldName = childElement.getName();
        // if table is incident, then description is encrypted for the
        short_description field
        if (tableName == 'incident' && fieldName == 'description') {
            field.valueFor(tableName, 'short_description');
        } else {
            // if table is not incident, ask the proxy to check if the given
            field is encrypted for the given table
            field.valueFor(tableName, fieldName);
        }
    }
}
```

In the encryptFieldsInRecord() function, the valueFor() method is called on a table and a field that are dynamically assigned based on the request. Even though the table and field names can change, the rule asks the proxy to check whether the field in the table must be encrypted based on the encryption configurations defined.

If the field is not configured for encryption, or if the tag does not match a field in the table, the proxy skips that tag. If the tag matches a field marked for encryption, then the Edge Encryption proxy server encrypts the value.

**Using an encoded query**

In this example, all tags have the filter attribute, which indicates whether the tag contains an encoded query.

```xml
<data>
  <record>
    <name filter="false">'Test Record 1'</name>
    <description filter="false">'Test Record 1 Description'</description>
    <query filter="true">category=1^name=edge</query>
  </record>
</data>
```
function sampleXmlAction3() {
  var xmlContent = request.getAsXmlContent();
  var tableName = request.urlParam.table; // This first iterator will iterate over all record elements
  var xmlElementIterator = xmlContent.getIterator('data/record');
  while (xmlElementIterator.hasNext()) {
    encryptFieldsInRecord(xmlElementIterator.next());
  }
}

function encryptFieldsInRecord(xmlElement) {
  // this time we want to iterate over all tags representing fields in the table
  var fieldIterator = xmlElement.getIteratorOverAllChildren();
  while (fieldIterator.hasNext()) {
    var field = fieldIterator.next();
    var fieldname = field.getName(); // let's look at the filter attribute, if true, then encrypt as encoded query
    if (field.getAttributeValue('filter') == 'true') {
      field.encodedQueryFor(tableName);
    } else {
      // if it is false then check if the field should be encrypted
      field.valueFor(tableName, fieldname);
    }
  }
}

If the filter attribute value is true, the rule asks the proxy server to encrypt the values in the encoded query. If false, the rule asks the proxy to check whether the field should be encrypted.

XMLContent
A global object that provides methods to iterate over the XML content.

You can access an XMLContent object by calling getAsXmlContent() on a request object.

You access XML data in a POST or URL parameter by calling request.postParams.<parameter name>.getAsXmlContent() or request.urlParams.<parameter name>.getAsXmlContent().

XMLContent - getIterator()
Returns an XMLElementIterator object for the XML content.

Table 406: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 407: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>XMLElementIterator</td>
<td>An object that can be used to iterate over elements in the XMLContent object.</td>
</tr>
</tbody>
</table>

XMLContent - getIterator(String xPath)

Returns an XMLElementIterator object for the XML content based on the specified parameter.

Table 408: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>xPath</td>
<td>String</td>
<td>An xPath-like expression that specifies where in the XMLContent object to start.</td>
</tr>
</tbody>
</table>

Table 409: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>XMLElementIterator</td>
<td>An object that can be used to iterate over elements in the XMLContent object.</td>
</tr>
</tbody>
</table>

XMLElementIterator

Provides methods for iterating over XML elements.

You get an XMLElementIterator object by calling the getIterator() method of the XMLContent class.

XMLElementIterator - hasNext()

Determines if there is another element available.

Table 410: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

Table 411: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boolean</td>
<td>True if another element is available.</td>
</tr>
</tbody>
</table>

XMLElementIterator - next()

Returns the next element in the iterator.

You cannot call next() without first calling hasNext().
Table 412: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 413: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>XMLElement</td>
<td>The next XML element.</td>
</tr>
</tbody>
</table>

XMLElement

Provides methods for iterating through XML elements and mapping values to fields in a table.

You get an XMLElement object by calling the next() method of an XMLElementIterator object.

XMLElement - getIterator(String xPath)

Returns an XMLElementIterator object for the XML element based on the specified parameter.

Table 414: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>xPath</td>
<td>String</td>
<td>An xPath-like expression that specifies where in the XMLElement object to start.</td>
</tr>
</tbody>
</table>

Table 415: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>XMLElementIterator</td>
<td>An object that can be used to iterate over elements in the XMLElement object.</td>
</tr>
</tbody>
</table>

XMLElement - getIteratorOverAllChildren()

Returns an XMLElementIterator object that includes all sub-elements for the XML element based on the specified parameter.

Table 416: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 417: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>XMLElementIterator</td>
<td>An object that can be used to iterate over elements in the XMLElement object.</td>
</tr>
</tbody>
</table>
XMLElement - `valueFor(String tableName, String fieldName)`
Specifies that the value of the element maps to the specified field in the specified table.

Calling this method on an element value tells the proxy that the value for this element maps to the specified field in the specified table. The proxy then checks if the field must be encrypted. If the table and field names are unknown, you can call the `valueFor()` method on a table and a field that are dynamically assigned based on the request.

<table>
<thead>
<tr>
<th>Table 418: Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name</strong></td>
</tr>
<tr>
<td>tableName</td>
</tr>
<tr>
<td>fieldName</td>
</tr>
</tbody>
</table>

XMLElement - `encodedQueryFor(String tableName)`
Specifies that the value of the element is an encoded query for the specified table.

Calling this function on an element tells the proxy that the value of the element is an *encoded query* for the specified table. The proxy parses the encoded query and encrypts the fields in the encoded query that must be encrypted.

<table>
<thead>
<tr>
<th>Table 420: Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name</strong></td>
</tr>
<tr>
<td>tableName</td>
</tr>
</tbody>
</table>

XMLElement - `getName()`
Returns the element name.

<table>
<thead>
<tr>
<th>Table 422: Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name</strong></td>
</tr>
<tr>
<td>None</td>
</tr>
</tbody>
</table>
Table 423: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>The element name.</td>
</tr>
</tbody>
</table>

XMLElement - getAttributeValue(String attribute)

Returns the value of the specified attribute.

Table 424: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>attribute</td>
<td>String</td>
<td>Attribute name.</td>
</tr>
</tbody>
</table>

Table 425: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>The attribute value.</td>
</tr>
</tbody>
</table>

**JSON APIs**

JSON APIs can be used after calling getAsJsonContent() on either the request object or a ParameterValue property.

When using JSON APIs to write your encryption rule, you can follow a general format:

1. Call getAsJsonContent() on the request object. This returns an iterable object of the JsonNode underlying class.
2. Call getIterator() or getIterator(String xPath) on the JsonNode object. This returns a JsonNodeIterator object that can be used to iterate over nodes in the JSON object.
3. Call the hasNext() method on the JsonNodeIterator object to determine whether another element is available.
4. Call next() on the JsonNodeIterator object to return the next JSON element. You cannot call next() without first calling hasNext().
5. Call valueFor(String tableName, String fieldName) on the JSON element. This method tells the proxy that the value for this element maps to the specified field in the specified table. The proxy then checks whether the field must be encrypted.

**Note:** To determine if you want to call valueFor(String tableName, String fieldName) on a JSON element, you can use the getName() method to return the name of the element.

**Mapping to a known table-field on the instance**

In this example, the JSON payload is processed on the instance to insert records in the incident table. The description field populates short_description on the incident.

```json
{
    data: {
        records: [
            {
```
The following rule can apply:

```javascript
function sampleJsonAction1() {
  var jsonContent = request.getAsJsonContent();
  // This loop iterates over all description elements in the records array
  var jsonNodeIterator = jsonContent.getIterator('/data/records/description');
  while (jsonNodeIterator.hasNext()) {
    var jsonNode = jsonNodeIterator.next();
    jsonNode.valueFor('incident', 'short_description');
  }
}
```

This action iterates through the description nodes and asks the proxy server to encrypt the values and insert them into incident.short_description on the instance.

**Note:** This rule finds all description nodes within the JSON payload. If there is only one occurrence of a node to encrypt, the rule still uses the XPath and iterator structure. However, it iterates only once in the loop.

---

**Mapping to an unknown table-field on the instance**

In this example, the rule iterates over records, but is not sure what nodes to expect. The only known is that for each object within records, the nodes match the names of the columns specified in the table URL parameter.

The rule also specifies that, if the table is incident, then the data in the description node should be encrypted and stored in the short_description field on the instance.

```javascript
function sampleJsonAction2() {
  var jsonContent = request.getAsJsonContent();
  var tableName = request.urlParam.table;
  // This first iterator will iterate over all record elements
  var jsonNodeIterator = jsonContent.getIterator('data/records');
  while (jsonNodeIterator.hasNext()) {
    encryptFieldsInRecord(jsonNodeIterator.next());
  }
}
```

```javascript
function encryptFieldsInRecord(jsonNode) {
  // this time we want to iterate over all nodes
  var fieldIterator = jsonNode.iterator();
  while (fieldIterator.hasNext()) {
    var field = fieldIterator.next();
    var fieldname = childElement.getName();
    if (fieldName == 'description') {
      field.valueFor(tableName, 'short_description');
    } else {
    }
  }
}
```
In the encryptFieldsInRecord() function, the valueFor() method is called on a table and a field that are dynamically assigned based on the request. Even though the table and field names can change, the rule asks the proxy to check whether the field in the table must be encrypted based on the encryption configurations defined.

If the field is not configured for encryption, or if the node name does not match a field in the table, the proxy skips that node. If the node name matches a field marked for encryption, then the proxy encrypts the value.

**Using an encoded query**

```javascript
function sampleJsonAction3() {
    var jsonContent = request.getAsJsonContent();
    var tableName = request.urlParam.table;
    // This first iterator will iterate over all record elements
    var jsonNodeIterator = jsonContent.getIterator('data');
    while (jsonNodeIterator.hasNext()) {
        var jsonNode = jsonNodeIterator.next();
        if (jsonNode.getName() == 'records')
            encryptRecords(jsonNodeIterator.next());
        else if (jsonNode.getName() == 'query')
            jsonNode.encodedQueryFor(tableName);
    }
}

function encryptRecords(jsonNode) {
    // we iterate over all fields in the node
    var recordIterator = jsonNode.iterator();
    while (recordIterator.hasNext()) {
        encryptFieldsInRecord(recordIterator.next());
    }
}

function encryptFieldsInRecord(jsonNode) {
    // this time we want to iterate over all nodes
    var fieldIterator = jsonNode.iterator();
    while (fieldIterator.hasNext()) {
        var field = fieldIterator.next();
        var fieldName = childElement.getName();
        field.valueFor(tableName, fieldName);
    }
}
```

In this example, the rule iterates over data. As it finds records, it performs the same logic as in the second example, iterating over fields in each node. When it finds the query node, it calls encodedQueryFor() to encrypt values that should be encrypted in the query.

**JsonNode**

A global object that provides methods to iterate over the JSON content.

You can access a JsonNode object by calling `getAsJsonContent()` on a request object.

You access JSON content from a POST or URL parameter by calling `request.postParms.<parameter name>.getAsJsonContent()` or `request.urlParms.<parameter name>.getAsJsonContent()`.

**JsonNode - getIterator(String xPath)**

Returns a JsonNodeIterator object for the JSON content.

This method can only be used on the root node, but can be used to traverse deep into the JSON object. Subsequent traversals must use the iterator() method.
### Table 426: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>xPath</td>
<td>String</td>
<td>An xPath expression.</td>
</tr>
</tbody>
</table>

### Table 427: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>JsonNodeIterator</td>
<td>An object that can iterate over nodes in the JSON object.</td>
</tr>
</tbody>
</table>

JsonNode - iterator()

- Returns a JsonNodeIterator object that iterates over all child nodes of the current node.

### Table 428: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 429: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>JsonNodeIterator</td>
<td>An object that can iterate over nodes in the JSON object.</td>
</tr>
</tbody>
</table>

JsonNode - getAsString()

- Returns the current node value as a string.

### Table 430: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 431: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>The current node value.</td>
</tr>
</tbody>
</table>

JsonNode - getAsString(String propertyName)

- Returns the string value of the specified property.
Table 432: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>propertyName</td>
<td>String</td>
<td>Name of the property.</td>
</tr>
</tbody>
</table>

Table 433: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>The property value.</td>
</tr>
</tbody>
</table>

JsonNode - getName()  
Returns the name of the current JSON node.

Table 434: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 435: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>Name of the current JSON node.</td>
</tr>
</tbody>
</table>

JsonNode - valueFor(String tableName, String fieldName)  
Specifies that the JSON property maps to the specified field in the specified table.

Calling this method on a JSON property tells the proxy that the value for this property maps to the specified field in the specified table. The proxy then decides if the field must be encrypted. If the table and field names are unknown, you can call the valueFor() method on a table and a field that are dynamically assigned based on the request.

Table 436: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>tableName</td>
<td>String</td>
<td>The table name.</td>
</tr>
<tr>
<td>fieldName</td>
<td>String</td>
<td>The field name.</td>
</tr>
</tbody>
</table>

Table 437: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></td>
</tr>
</tbody>
</table>

JsonNode - encodedQueryFor(String tableName)  
Specifies that the value of the JSON property is an encoded query for the specified table.
Calling this function on a JSON node tells the proxy that the value is an *encoded query* for the specified table. The proxy parses the encoded query and encrypts the values for fields in the encoded query that must be encrypted.

**Table 438: Parameters**

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>tableName</td>
<td>String</td>
<td>The table that you expect the query to run on.</td>
</tr>
</tbody>
</table>

**Table 439: Returns**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></td>
</tr>
</tbody>
</table>

JsonNodeIterator

You get a JsonNodeIterator object by calling the getIterator() or iterator() methods of the JsonNode class.

JsonNodeIterator - hasNext()

Determines if there is another property available.

**Table 440: Parameters**

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 441: Returns**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boolean</td>
<td>True if another property is available.</td>
</tr>
</tbody>
</table>

JsonNodeIterator - next()

Returns the next property in the iterator.

You cannot call next() without first calling hasNext().

**Table 442: Parameters**

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 443: Returns**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>JsonNode</td>
<td>The next JsonNode.</td>
</tr>
</tbody>
</table>
print(String message)
Prints a message to the wrapper log file: <proxy server directory>/logs/wrapper_<date>.log.
This method is available only in an Edge Encryption rule action script.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>message</td>
<td>String</td>
<td>The message to be written to the wrapper log file.</td>
</tr>
</tbody>
</table>

Table 445: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></td>
</tr>
</tbody>
</table>

Prohibited keywords
The Edge Encryption proxy validates encryption rule scripts before saving the rule. Many JavaScript keywords are not allowed in encryption rule scripts.

Table 446: Prohibited keywords

<table>
<thead>
<tr>
<th>Keyword</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DIR</strong></td>
</tr>
<tr>
<td><strong>FILE</strong></td>
</tr>
<tr>
<td><strong>LINE</strong></td>
</tr>
<tr>
<td><strong>parent</strong></td>
</tr>
<tr>
<td><strong>proto</strong></td>
</tr>
<tr>
<td>Error</td>
</tr>
<tr>
<td>eval</td>
</tr>
<tr>
<td>getClass</td>
</tr>
<tr>
<td>getPrototypeOf</td>
</tr>
<tr>
<td>Java</td>
</tr>
<tr>
<td>javax</td>
</tr>
<tr>
<td>javafx</td>
</tr>
<tr>
<td>JavaImporter</td>
</tr>
<tr>
<td>load</td>
</tr>
<tr>
<td>loadWithNewGlobal</td>
</tr>
<tr>
<td>new</td>
</tr>
<tr>
<td>Packages</td>
</tr>
<tr>
<td>Object</td>
</tr>
</tbody>
</table>
Edge Encryption dictionary attributes

You can add Edge Encryption dictionary attributes to tables and fields.

To set a Edge Encryption dictionary attribute to true, you must enter attribute=true in the Attributes field. To add a dictionary attribute to a record, see Dictionary attributes.

Table 447: Edge Encryption dictionary attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Target element</th>
<th>Description</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edge Encryption Excluded [edge_encryption_excluded]</td>
<td>true/false</td>
<td>field or table</td>
<td>When set to true, the field or table cannot be encrypted.</td>
<td>False</td>
</tr>
<tr>
<td>Name</td>
<td>Value</td>
<td>Target element</td>
<td>Description</td>
<td>Default value</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>----------------</td>
<td>----------------</td>
<td>----------------------------------------------------------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>Edge Encryption Enabled</td>
<td>true/false</td>
<td>field</td>
<td>When set to true, the field is eligible for encryption through an encryption configuration. Because this attribute is used by the system and cannot be modified, it is not always displayed to the user.</td>
<td>True for String fields</td>
</tr>
</tbody>
</table>

**Note:**
This attribute does not indicate that a field is encrypted, nor does it trigger any encryption logic on the field. Rather, the attribute determines the possibility of the field being encrypted by a user.
<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Target element</th>
<th>Description</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edge Encryption Clear Text Allowed</td>
<td>true/false</td>
<td>field</td>
<td>When set to true, allows server-side scripts to append non-encrypted data to an encrypted string within the field for user actions performed through the proxy server, or any server-side automated scripts, such as scheduled jobs.</td>
<td>False</td>
</tr>
</tbody>
</table>

## Domain separation in Edge Encryption

Edge Encryption provides the ability to encrypt data from within the customer’s environment through the use of specific configurations, rules, and keys defined on the Edge Encryption proxy. The Edge Encryption proxy is not domain aware and cannot support domain-specific settings. Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.

### Overview

Support: Data only

Domain separation in this application is supported at the Data only level, meaning it supports the data security model of separating visibility of data from one domain to another. To learn more, see Application support for domain separation.

### How domain separation works in Edge Encryption

Edge Encryption can be used where domain-specific keys, configurations, and rules are not required.

### Data integration with Edge Encryption

To integrate third-party data with an instance using Edge Encryption, you must route the data through the Edge Encryption proxy server using supported integrations. Supported integrations use base system encryption rules that map data in each payload to fields in a table.
upload data to fields marked for encryption

Edge Encryption does not support importing data from or exporting data to Excel, CSV, XML, or other file types to or from fields with encryption configurations defined.

**ODBC driver**

Encrypt requests and query data through the Edge Encryption proxy server using the ODBC driver.

Learn more: [Edge Encryption ODBC driver integration](#) on page 1195

**MID Server**

You can configure the MID Server to route data through an Edge Encryption proxy server. However, some restrictions apply.

Learn more: [Edge Encryption MID Server integration](#) on page 1199

**REST/SOAP web services**

Use REST/SOAP web services to update or retrieve record data through the Edge Encryption proxy server.

Learn more: [Web services](#)

**JSONv2 web service**

Use JSONv2 web service APIs to update or retrieve record data through the Edge Encryption proxy server. Base system encryption rules support data retrieval and data modification APIs.

- To insert a single record using the data modification API, use the insert() or insertMultiple() methods.
- To insert multiple records using the data modification API, use the insertMultiple() method.

Learn more: [JSONv2 Web Service](#)

To encrypt data from custom third-party integrations not listed above, create custom encryption rules. See [Define a custom encryption rule](#) on page 1168.

**Upload attachments to records marked for encryption**

Attachments can be uploaded to tables with attachment encryption configured using REST and SOAP web services.

**Edge Encryption ODBC driver integration**

Configure your ODBC driver to query data encrypted by Edge Encryption. The Edge Encryption proxy server encrypts ODBC driver requests to the ServiceNow instance when Edge Encryption is integrated with the ODBC driver.

Encrypted responses from the instance are decrypted through the Edge Encryption proxy server before passing to the ODBC driver in your network.
For a successful integration, the ODBC driver must trust the Edge Encryption proxy server certificate. If the Edge Encryption proxy server certificate is signed by a Certificate Authority trusted by the ODBC driver, the Edge Encryption proxy server is automatically trusted. However, if a Certificate Authority trusted by the ODBC driver has not signed the Edge Encryption proxy server certificate, you must import the self-signed certificate to the ODBC truststore.
Import a self-signed certificate to the ODBC truststore

If a Certificate Authority trusted by the ODBC driver has not signed the Edge Encryption proxy server certificate, you must import a self-signed certificate to the ODBC truststore. You can export the certificate from the Edge Encryption proxy server and import it into the ODBC truststore.

To determine whether a Certificate Authority trusted by the ODBC driver has signed the Edge Encryption proxy server certificate, run the following command in the keystore directory in the proxy home directory to view a list of Certificate Authorities trusted by the ODBC driver:

```
keytool -keystore "<ODBC directory>\ip\Java\jre\lib\security\cacerts" -list
```

1. Change to the keystore directory in the proxy home directory.
2. Check the keystore for the self-signed certificate.
   a) To check the keystore for the certificate, you can run the following command to list all the items in the keystore.
      ```
      keytool -list -keystore keystore.jceks -storetype jceks -v
      ```
   b) Locate the key alias in the list of items.
3. Using the key alias, export the certificate to a .cer file.
   ```
   keytool -export -alias <key alias> -keystore keystore.jceks -storetype jceks -rfc -file <file name>.cer
   ```
4. Change to your ODBC truststore directory: ODBC\ip\Java\jre\lib\security\cacerts.
5. Import the certificate to your ODBC truststore.
   ```
   keytool -keystore cacerts -importcert -alias $<key alias> -file <file name>.cer
   ```

Set the ODBC driver properties

Set the ODBC driver properties to route requests through the Edge Encryption proxy server.

1. In Windows, navigate to Start Programs ServiceNow ODBC Management Console.
2. Expand the console tree root to: ServiceNow ODBC Manager\Manager\<installation location>\Services\ServiceNow_ODBC\Data Source Settings\ServiceNow\IP Parameters.
3. Double-click the DataSourceIPProperties attribute.
4. Change the Value to the URL of your Edge Encryption proxy server, such as https://<IP address>:\<port>
5. Click OK.

The ODBC driver is now configured to route requests to the instance through the Edge Encryption proxy server.

**Edge Encryption MID Server integration**

Configure the MID Server to route data through an Edge Encryption proxy server.

When integrated with the MID Server, the Edge Encryption proxy server acts as the MID Server's endpoint. The Edge Encryption proxy server then encrypts and decrypts data passing between the ServiceNow instance and the MID Server.

**Limitations when integrating with the MID Server**

When MID Server data is configured to pass through the Edge Encryption proxy server, the following limitations apply:

- Encryption of ECC Queue fields is not supported.
- Encrypted data cannot be used with Discovery or Service Mapping.

**Point the MID Server to the Edge Encryption proxy server**

To pass data from the MID Server through the Edge Encryption proxy server, update the MID Server configuration file to point the MID Server to the Edge Encryption proxy server.

When configuring the MID Server to pass through the Edge Encryption proxy server, you cannot use the web proxy properties in the MID Server configuration file to route traffic through the Edge Encryption proxy server to your instance. Instead, you must set the Edge Encryption proxy server as the MID Server's endpoint.

1. Navigate to your local MID Server directory and open the config.xml file.
2. Find the element `<parameter name="url" value="https://YOUR_INSTANCE.service-now.com" />` and change the value property to the URL of your Edge Encryption proxy server. For example, `http://hostname.mycompany.com:8081`.
   This step directs the MID Server to pass traffic to the Edge Encryption proxy server instead of the instance. The Edge Encryption proxy server in turn encrypts any necessary fields and passes the payload to the instance.
3. Save and close the file.
4. If running, restart the MID Server.

**Edge Encryption diagnostics and performance**

Monitor Edge Encryption proxy server performance trends and drill into errors generated by the Edge Encryption proxy server.

**Edge proxy performance**

View key Edge Encryption proxy server performance trends using the Edge Proxy graph set on the ServiceNow Performance homepage. Monitored trends include:

- Maximum and average response times between the client, proxy server, and instance.
- CPU, disk space, and memory usage of the host machine.
• Maximum and average network latency between the proxy server and the ServiceNow instance.

**Note:** Edge Encryption proxy servers with duplicate names do not report performance trends.
Edge Processing (Max and Average)

Maximum and average time in milliseconds to process a request. These data points are general trends over time.
• Total Time: Time for the proxy server to receive a request from a client and send a response. This data point is the sum of the subsequent data points.
• Proxy Response: Time for the proxy server to process a response from the instance.
• Proxy-Instance Round Trip: Time for the proxy server to send a request to the instance and receive a response. Includes network latency between the proxy server and the instance and time spent by the instance to process the request.
• Rules: Time for the proxy server to evaluate a request using defined encryption rules.
• Proxy Request: Time for the proxy server to process a client request and forward it to the instance.

Edge Proxy Performance (Max and Average)  
Maximum and average percentage of resources used on the host machine.
• CPU Usage
• Memory Usage
• Disk Usage

Edge Proxy Latency  
Maximum and average network latency in milliseconds at a given point in time. Latency is determined by round-trip time for a proxy server to send a simple ping to the instance and receive a response.

Proxy Error Reports  
Navigate to Edge Encryption Configuration Diagnostics and Troubleshooting Proxy Error Reports to view all proxy server errors collected over the past seven days.
Errors are collected over a one-minute period. Each minute, an error report is generated. The vertical axis displays the number of error reports over the last seven days that include each error. For example, even if the DEFAULT_ERROR_CODE error is thrown multiple times over a one-minute report period, the DEFAULT_ERROR_CODE bar will only reach one on the Number of Error Reports axis.

From this view, you can:

- Click each proxy error code bar to see the report on a single error for each proxy server. From this view, you can click the bar again to view the error text in the Edge Encryption Proxy Stat table [edge_encryption_stat]. Follow links in the error text to see more information and possible remediation steps.
- Click Other to see page two of the error report.

**Note:** If you have more than one proxy server with the same name, a single DUPLICATE_PROXY_NAME error appears in the Proxy Error Report. No other errors are reported for proxy servers with duplicate names. If you encounter this error, make sure that all proxy servers have unique names.

**Additional monitoring resources**

The instance tracks all encryption proxies. Each Edge Encryption proxy server registers when it starts up. The instance is notified when:

- A new Edge Encryption proxy server starts up.
- An Edge Encryption proxy server is intentionally shut down.

If an Edge Encryption proxy server attempts to register with an instance that does not have Edge Encryption installed, the proxy does not start.
All encryption configuration files are audited. Deleted records are audited on all encryption configuration files. Audit records are put in the sys_audit table. To view the history of a specific configuration record, view the record, and click History List in the menu. The Mass Encryption Job is not audited.

Use the following additional resources to monitor your proxy servers.

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Invalid Insert Attempts</td>
<td>List of attempts to save the following data to encrypted fields: invalid_insert_log.</td>
</tr>
<tr>
<td>Job Failures</td>
<td>A list of jobs that did not execute successfully.</td>
</tr>
<tr>
<td>System logs</td>
<td>The instance periodically checks for messages from each registered proxy server. If a proxy server has not sent a message in the required time frame, an error is logged. The log message contains information about the encryption proxy and the last time the proxy pinged the instance. If the instance determines that none of the encryption proxies are online, it logs a message. These messages are added to the system log.</td>
</tr>
</tbody>
</table>

Disable or reduce Edge Proxy statistic collection

Prevent the Edge Encryption proxy server from sending Edge Proxy Graph Set statistics to the ServiceNow Performance homepage, or reduce the frequency of statistic collection.

Role required: admin or security_admin

By adding properties in the edgeencryption.properties configuration file, you can:

- Disable the Edge Proxy graph set.
- Change the interval during which statistics are collected by the Edge Encryption proxy server. By default, statistics are collected every 30 seconds.

1. In your proxy server installation directory, open the edgeencryption.properties configuration file located in the <installation directory>/conf/ folder.
2. Add one of the following properties.
<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
</table>
| edgeencryption.stat.collection.enabled | Enables the collection of statistics used by the Edge Encryption proxy server performance dashboard.  
• Default value: true  
Add this property and set the value to false to disable the collection of statistics used by the Edge Encryption proxy server performance dashboard. After adding proxy server performance properties, you must restart the proxy server for the change to take effect. |
| edgeencryption.stat.collection.interval | Interval length in seconds during which the Edge Encryption proxy server collects statistics. The value cannot be less than 30 seconds.  
• Default value: 30  
After adding proxy server performance properties, you must restart the proxy server for the change to take effect. |

3. Restart the proxy server.

Flow Designer

Flow Designer is a Now Platform feature that enables rich process automation capabilities in a consolidated design environment. It enables process owners to use natural language to automate approvals, tasks, notifications, and record operations without having to code.

You can expand the Flow Designer solution to integrate with external instances and third-party applications with a separate subscription to IntegrationHub on page 1327.

Benefits

Flow Designer provides process owners and developers these benefits.

• Consolidates multiple Now Platform automation capabilities into a single environment so process owners and developers can build and visualize business processes from a single interface.
• Consolidates configuration and runtime information into a single environment so process owners and developers can create, operate, and troubleshoot flows from a single interface.
• Provides natural-language-descriptions of flow logic to help non-technical users understand triggers, actions, inputs, and outputs.
• Promotes process automation by enabling subject matter experts to develop and share reusable actions with flow designers.
• Reduces upgrade costs, with upgrade-safe Now Platform® logic replacing complex custom script.
• Reduces development costs by providing a library of reusable actions.
• Allows extending Flow Designer content by subscribing to IntegrationHub or installing spokes.

Interactions with existing automation processes

While learning Flow Designer, make sure that you understand how existing Now Platform automation processes such as business rules and workflows change records to avoid creating conflicting logic. See the Architecture Overview on page 1208 to understand how Flow Designer works within the Now Platform. If you are replacing an existing automation process, you may need to deactivate it before replacing it with Flow Designer flows and actions.

Flow Designer content

Flow Designer consists of the following content types.

**Flows**

A **flow** is an automated process consisting of a sequence of actions and a trigger. Flows automate business logic for a particular application or process. For example, the VTB Sample Flow creates and assigns a VTB card whenever a priority 1 incident is created. Flows require some familiarity with the Now Platform tables and fields the application or process uses. Process analysts can create flows using available actions or copy an existing flow to use it as a template. You can add application-specific flows by activating the associated spoke.

**Subflow**

A **subflow** is an automated process consisting of a sequence of reusable actions and specific data inputs that allow it to be started from a flow, subflow, or script. Subflows automate generic business logic that can be applied to multiple applications or processes. For example, you could create a subflow to notify users of record changes. Subflows require some familiarity with the Now Platform tables and fields the application or process uses. Process analysts can create subflows using available actions or use an existing flow as a template.

**Actions**

An **action** is a reusable operation that enables process analysts to automate Now Platform features without having to write code. For example, the Create Record action allows process analysts to generate records in a particular table with particular values when certain conditions occur. Core actions like Create Record require some familiarity with Now Platform tables and fields. Action designers can create application-specific actions to preset configuration details. For example, creating a Create Incident Task action ensures that the process analyst uses the correct table and field configuration each time the action is used.
add application-specific actions by activating the associated spoke.

Core actions
A core action is a ServiceNow-provided action available to any flow that cannot be viewed or edited from the Action Designer design environment. For example, the Ask for Approval action is a core action that allows process analysts to use Now Platform approvals. Flow Designer provides a set of core actions to automate Now Platform processes. You can add application-specific core actions by activating the associated spoke.

Action steps
An action step or step is a single reusable operation within an action. For example, the Create Record step allows action designers to specify the table and field values to use during record creation. Action steps require subject matter expertise with application tables, fields, and business logic. Application developers or IT generalists add action steps to actions from the Action Designer design environment. Flow Designer provides a set of core action steps to automate Now Platform processes. You can add application-specific action steps by activating the associated spoke.

Spokes
A spoke is a scoped application containing Flow Designer content dedicated to a particular application or record type. For example, the ITSM Spoke contains actions for managing Task records such as the Create Task action. Spokes are activated when their parent application is activated. For example, the ITSM Spoke is activated when the Incident, Problem, and Change applications are activated. Creating a spoke requires familiarity with application development as developers must add Flow Designer content to a scoped application. See Spokes on page 1310 for a list of available spokes.

Consolidated design and operation environment
The design environment consists of these components.

Landing page
Access or create flows, actions, or flow executions.

Flow Designer
Create and edit flows by defining a trigger and adding actions. Test flows to see if they complete successfully and to review the runtime values they generate. Activate flows to make them available for execution on your instance and to preserve their current actions, inputs, and sequence as a snapshot separate from further configuration changes.

Action Designer
Create and edit actions by defining inputs and adding action steps. Copy actions to use existing
actions as templates. Publish actions to activate them, which makes them available to activated flows and to preserve their current action steps, variables, and sequence as a snapshot separate from further configuration changes.

**Flow execution details**

View runtime information about a flow directly from the design environment such as the current state, actions run, and values produced. Open related records from embedded Now Platform editors or in a new tab.

**Operations dashboard**

Identify and troubleshoot potential issues by reviewing flow executions, the event queue, and the operations dashboard.

**User access and security considerations**

Administrators can grant users access to Flow Designer by assigning delegated development permissions or directly assigning a user role.

**Granting access by assigning delegated development permissions**

Administrators can grant users access to Flow Designer by creating an application and assigning users as developers with the Flow Designer delegated development permission. Delegated development allows administrators to control whether flow designers can access features normally restricted to admin users such as assigning user roles, creating access controls, or creating scripts. See [Developer and deployment permissions](#).

**Granting access by assigning user roles**

Administrators can also grant access to Flow Designer by directly assigning users the flow_designer user role, which includes the role to view flow execution details.

**Warning:** Directly granting a user the flow_designer role is equivalent to giving the user the admin role, because Flow Designer runs as the System user, which has access to all tables and all database operations.

**Architecture Overview**

Understand how Flow Designer works within the Now Platform to activate, trigger, and process flows and actions.

A flow consists of a trigger and one or more actions. The trigger specifies when to start the flow, which can be record-based, schedule-based, or application-based. Record-based triggers run a flow after a record has been created, updated, or deleted. The flow can use the triggering record as input for actions. Schedule-based triggers run a flow at the specified date and time. The flow can use the execution time as input for actions. Application triggers are added when the associated application is activated. For example, the MetricBase trigger is present when the MetricBase application is active.
Flow processing

Flow processing occurs in this sequence.

1. When the flow trigger conditions occur, the system creates an entry in the event queue to start the flow.
2. The scheduler processes the event and starts the flow in the background.
3. The system builds a process plan from the flow.
4. The system runs the process plan using the record that triggered the flow.
5. The system stores the execution details in a context record.

1. Process Flow Triggers
2. Process Events in the Queue
3. Build Process Plan
4. Run Process Plan

1. Process flow triggers

Each time trigger conditions are met, Flow Designer creates an event entry. The system processes triggers after database operations. To learn more, see Execution order of scripts and engines. Typically, business rules and workflows that run synchronously run before a triggered flow.

2. Process events in the queue

Each flow event contains a reference to the flow to start and a reference to either the triggering record or the execution time. The system processes these events using Standard event processing where a scheduler periodically works through the current items in the event queue in the order in which they were added. Depending on what other events are in the queue, the system may not immediately start a flow. Flow designers should expect some lag time between when the trigger conditions occur and when the flow actually starts.
3. Build the process plan

When Flow Designer pulls an event from the queue, it builds a process plan to actually run the flow. A process plan contains all the information necessary to execute a flow such as the sequence of published actions or subflows, the input values for each subflow or action, the action steps to run for each action, and the data provided by the trigger or subflow output.

Flow Designer uses a just-in-time compilation scheme to ensure that process plans contain the latest changes to flows, subflows, and actions. If no changes are detected, Flow Designer uses a cached copy of the process plan. Otherwise, it builds a new process plan.

By automatically checking for updated flows, subflows, and actions with process plans, Flow Designer enables you to apply changes from update sets and upgrades without having to edit current flows. If you move published actions to a target instance, every flow that uses the published action will automatically update the next time it is executed.

**Warning:** If changing subflows or actions used in activated flows, do not change the inputs and outputs used in the subflow or action. Changing inputs and outputs may cause errors when the activated flow is next triggered because it has not been configured to use the new inputs and outputs. Any currently running flows are unaffected by changes to inputs or outputs as the flow uses the compiled subflows and actions from the process plan.

4. Run the process plan

Flow Designer runs the process plan as the System user within the flow application scope.

When running a flow with a record-based trigger, Flow Designer stores the triggering record in memory as an instance that is represented in the interface as a data pill.

The instance contains the record values from when the flow started, which may be different than the current record stored in the database. For example, suppose that creating an incident record triggers a flow. Any changes a user makes to the incident record after the flow has started do not update the triggering record unless an action specifically looks up the current record value.

5. Store flow execution details

Flow Designer stores flow execution details in a flow context record, which contains this information.

- Flow outcome state
- Flow runtime duration
- Flow log messages
- Flow configuration and runtime values

Each time a flow runs, Flow Designer adds an entry to the Flow Executions list. Each entry has its own context record and matching execution details page.

A flow can have one of these outcome states.

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete</td>
<td>The flow completed successfully.</td>
</tr>
<tr>
<td>In Progress</td>
<td>The flow is running. By default, a transaction quota rule prevents flows from running longer than an hour.</td>
</tr>
<tr>
<td>Waiting</td>
<td>The flow is waiting for another event to occur. For example, a user must update a task or approval, or a record must reach a specific state. When in the waiting state, the flow is quiesced and serialized into a context record.</td>
</tr>
<tr>
<td>Canceled</td>
<td>The flow was canceled by a user.</td>
</tr>
<tr>
<td>Error</td>
<td>The flow encountered an error and has stopped running. For example, an action is missing an input value, or a quota transaction rule has stopped the flow.</td>
</tr>
</tbody>
</table>

Flow, subflow, and action life cycle

Flow Designer uses the flow or action status to describe the current state of configuration changes.

Flow and subflow status and activation state

The Status field indicates whether there is a process plan associated with the flow or subflow.

<table>
<thead>
<tr>
<th>Flow status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modified</td>
<td>Indicates that there are unsaved changes to a flow or subflow. Modified flows or subflows have not been saved.</td>
</tr>
<tr>
<td>Flow status</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Draft</td>
<td>Indicates that there are saved changes to a flow or subflow, which have not been stored in a process plan. Draft flows have been saved but not activated. Draft subflows have been saved but not published.</td>
</tr>
<tr>
<td>Published</td>
<td>Indicates that there is a stored process plan for the flow or subflow. Published flows have either been activated or deactivated.</td>
</tr>
</tbody>
</table>

The Active field indicates whether the system runs a flow or subflow.

<table>
<thead>
<tr>
<th>Active</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>True</td>
<td>Indicates that the flow or subflow is active and runs when triggered or called. The flow has been activated or the subflow has been published. Active flows run when the trigger conditions are met or when called. Active subflows run when called.</td>
</tr>
<tr>
<td>False</td>
<td>Indicates that the flow is inactive and does not run when triggered or called. An inactive flow has either never been activated or has been deactivated. An inactive subflow has never been published.</td>
</tr>
</tbody>
</table>

When working with flows, you can:
- Save a flow: Creates a draft of the flow.
- Activate a flow: Enables the flow trigger and transform the flow into a process plan.
- Deactivate a flow: Disables the flow trigger and prevents new flow executions. Currently running flows continue to run.

When working with subflows, you can:
- Save a subflow: Creates a draft of the subflow. If the subflow is modified after being published, the subflow moves into a draft state. Any active flows that use the subflow only run the published action.
- Publish a subflow: Enables you to activate a flow containing the subflow. Publishing adds the subflow to the list of available subflows in a flow.
Action status

The Action Designer interface does not display the configuration status of actions. To view action status, navigate to the Action Types table [sys_hub_action_type_definition] and display the Draft state field.

<table>
<thead>
<tr>
<th>Action Draft status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draft</td>
<td>Indicates that there are changes to an action that have not been published. Draft actions are only available to flows when the Show draft actions option is enabled. You cannot activate a flow containing draft actions.</td>
</tr>
<tr>
<td>Published</td>
<td>Indicates that the action has been published. Published actions are available to all flows and allow flows to be activated.</td>
</tr>
</tbody>
</table>

When working with actions, you can:

- Save an action: Creates a draft of the action that is only available to flows when Show draft actions is enabled. If the action is modified after being published, the action moves into a draft state. Any active flows that use the action only run the published action.
- Publish an action: Enables you to activate a flow containing the action. Publishing adds the action to the list of available actions in a flow. Only actions in a published state run during flow execution.
Application development

When designing an action or a flow, use these design considerations as a guide.

Use standard Now Platform application development capabilities to create, manage, protect, and deploy Flow Designer content. Flow and action designers typically perform these application development tasks.

- Create a custom application to store flows and actions.
- Set application permissions to share or restrict access to application data.
- Grant application developers access to Flow Designer.
- Publish custom applications to the application repository to deploy flows and actions on other instances.

Security

Control access to Flow Designer processes and records.

- Administrators can grant users access to Flow Designer by creating an application and assigning users as developers with the Flow Designer delegated development permission. Delegated development allows administrators to control whether flow designers can access features normally restricted to admin users such as assigning user roles, creating access controls, or creating scripts. See Developer and deployment permissions.
- Administrators can also grant access to Flow Designer by directly assigning users the flow_designer user role, which includes the role to view flow execution details.

**Warning:** Directly granting a user the flow_designer role is equivalent to giving the user the admin role, because Flow Designer runs as the System user, which has access to all tables and all database operations.

- Flow and action designers can use standard Application access settings to manage how their content interacts with other applications.

Action limit

By default, flows can have no more than 50 actions. To change the default behavior, increase the value of the sn_flow_designer.max_actions system property. However, consider the performance impact that a large flow may have on your instance.

Trigger options for record updates

Flow designers can specify how often a flow can update a particular record with the Run Trigger option. Use the Once option when you want a flow to run only once. The first time a record is updated, the flow
runs, but any further record updates do not trigger the flow. Use the Always option when you want the flow to run every time a record is updated and there is not already an active flow running for it. For example, you might set a flow that assigns an incident record to run only once, and set a flow that notifies the incident watch list to always run. The Run Trigger field is only available for these trigger types.

- Created or Updated
- Updated

**Direct recursion prevention and indirect recursion limit**

To prevent instance outages and consumption of system resources, Flow Designer ignores any request to start a flow that is the result of direct recursion. Direct recursion occurs under these conditions.

- An action calls the same flow that it is part of. For example, a script step makes an API call to a flow.
- An action or subflow produces a result matching the flow trigger. For example, a flow that runs when an incident record is updated contains an update record action that updates an incident record.

Flow Designer also limits the number of times a flow can be started from indirect recursion. Indirect recursion occurs under these conditions.

- The same flow is called multiple times in a chain of subflow calls. For example, if subflow A calls subflow B, and subflow B calls subflow A, then calling either subflow produces indirect recursion.
- The same flow is triggered multiple times in a chain of subflows. For example, suppose that there are two flows triggered by record creation. Suppose that creating record A triggers flow A and also creates record B. Furthermore, creating record B triggers flow B and creates record A. Creating either record type produces indirect recursion.

By default, the system stops triggering flow runs after the run count reaches the indirect recursion limit of three runs. Administrators can change the limit by setting the system property `com.glide.hub.flow_engine.indirect_recursion_limit` to an integer value equal to or greater than one. The system ignores any property value less than one and instead uses a limit of one. Consider the performance impact that increasing the indirect recursion limit may have on your instance.

**Note:** By default, a transaction quota rule prevents flows from running longer than an hour.

**Data pill population**

Each time you add an action to a flow, Flow Designer adds a data pill to store its results. The data pill name indicates its sequence in the flow and its data type. Flow designers use action result data pills to provide input for other flows, actions, or subflows. Flow designers can use the sequence value in the data pill name to ensure that they select the correct data pill as an input value. When a flow runs an action, it generates the data pill runtime value, which remains the same for the duration of the flow. For example, a data pill for [Trigger->Incident record] always contains the incident record values from when the flow started.

Flow Designer populates data pill values as soon as the data becomes available regardless of where the data pill is located in the flow sequence. For example, suppose that you have a flow triggered by the creation of an incident record with the following actions.

1. Update [Incident] Record that adds a text string to [Trigger->Incident Record->Short description].
2. Log the value of [Trigger->Incident Record->Short description].
3. Log the value of [1->Incident Record->Short description].
Action-1 and Action-2 both use the data pill [Trigger->Incident Record->Short description]. Since the trigger record is available as soon as the flow starts, these values are set before running these actions.

Flow and action testing

Testing a flow bypasses the trigger conditions and immediately runs it. Testing a flow with a record-based trigger requires selecting a specific record to act as the trigger. Flow designers should generate appropriate sample records prior to testing.

During the design phase, you can test an inactive flow and unpublished actions by setting Show draft actions on the flow. If testing with draft actions, use these guidelines.

- Design flows and actions on a non-production instance. Only deploy active, working flows to your production instance.
- Leave Show draft actions set to true until your draft is in a final state. Once final, publish each action, set Show draft actions to false, and activate the flow.

**Warning:** Disabling Show draft actions before publishing your actions removes all draft actions from your flow.

- Any change you make to an active flow or published action causes it to return to a draft state. If the flow is triggered, the system only runs the activated flow and published actions, and the flow execution details only display what was run. When there is a draft of an active flow, the trigger and actions listed in the flow execution details may be different than those listed in the draft flow.

Domain separation in Flow Designer

Flow Designer is not domain separated and does not support manually adding a domain field. Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.

Overview

Domain separation is not supported in this application. For more information, see Application support for domain separation.

Getting started with flows

Create a sample flow with a trigger and base system actions that requires an approval.

Role required: admin

**Note:** While Flow Designer is designed to use the flow_designer and delegated_developer roles in most scenarios, this tutorial uses the admin role to illustrate functionality without requiring additional roles to set up records and approve requests.

The ITSM application is required to access the Task table.

A flow can include these components:

- Trigger: An activity that initiates the flow, such as a record created in a specified table or a scheduled job.
• Conditions: Statements that determine when or how an action runs. For example, run an action only if a field is over a certain value.
• Actions: Operations executed by the system, such as a field value updated, approval requested, or a value logged.

To understand basic flows, create an expense approval flow. This flow:

1. Runs when an Expenses record is created.
2. Uses the total amount to determine which action to run.
3. Approves the request if it is under the specified dollar amount.
4. Requires manager approval if it is over a specified dollar amount. Another approver can be manually added.

1. Create a custom application for the flow. Creating flows and actions within an application enables you to publish flows and actions to an application repository and deploy them on other instances. While this example does not use delegated development, you can optionally delegate action and flow designer development by assigning developers to the application.
   a) Navigate to System Applications Studio.
   b) Create a custom application called Expenses Getting Started.

2. In Studio, create an Expenses table.
   a) Click Create Application File.
   b) Under Data Model, select Table and click Create.
      A Table form opens.
   c) Complete the form with the following values.
      • Label: Expenses
      • Extends table: Task
   d) Save the form.
   e) Add three additional columns to the table.

<table>
<thead>
<tr>
<th>Column label</th>
<th>Type</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount</td>
<td>Floating point number</td>
<td>None</td>
</tr>
<tr>
<td>Destination</td>
<td>String</td>
<td>None</td>
</tr>
<tr>
<td>Requested for</td>
<td>Reference</td>
<td>User [sys_user]</td>
</tr>
</tbody>
</table>

3. Add four records to the Expenses table to use in Flow Designer tests. When you test your flow in later steps, you can specify which record is used as the trigger, enabling you to test specific record values.
   a) On the Expenses table record, click the Show list related link.
   b) Click New.
   c) Configure the form to add the Amount, Destination, and Requested for fields, and the Approvers related list.
   d) Complete the Destination and Requested for fields. In the Amount field, add a value under 100.00.
Make sure that the user in the Requested for field in the test record has a manager assigned in the system. If the user in the test record does not have a manager, configure the User form to add the Manager field, and assign a manager to the user.

e) Submit the form.
f) Add another record to the table with an amount under 100.00.
g) Add two more records to the table with a value over 100.00 in the Amount field.

4. In Studio, create a new flow.
a) Click Create Application File.
b) Under Flow Designer, select Flow and click Create.
c) Select the Flow option, click Next.
d) In the Flow Name field, enter Expense Approval.
e) Click Submit.
An Expense Approval flow is created in the Expenses Getting Started scope.

5. Create a trigger that runs the flow when a record is created in the Expenses table.
   • Trigger: Created
   • Table: Expenses [x_expenses_getting_expenses]

   ![Trigger Configuration]

6. Add an if condition to the flow.
a) Select Flow Logic If.
b) In the right-hand pane, expand the Trigger - Record Created category and the [Expenses Record] pill. Drag-and-drop the [Amount] pill into Condition 1. A data pill represents the value of a record or a field at a particular stage in your flow. Dragging the [Amount] data pill from the trigger populates the condition with the value of the field in the triggering record.
c) Set Condition 1 to [Trigger->Expenses Record->Amount] [less than] [100.00].
7. Underneath action 1, click + to add an action that runs when the If condition is met.

8. Create an Update Record action that approves the request.
   - Action: Update Record
   - Record: Expand the Trigger - Record Created category and drag the [Expenses Record] data pill from the right-hand pane.
   - Table: Set to Expenses [x_expenses_getting_expenses].
   - Fields:
     - Approval: Approved
     - Work notes: Auto-approved. Amount less than $100.00
9. Add an else condition to the flow.
   a) Select Flow Logic Else.

10. Underneath action 2, click + to add an Ask for Approval action that runs when the Else condition is met.
   a) Complete the fields in the Ask for Approval step.
      • Action: Ask for Approval
      • Record: Expand the [Trigger - Record Created] category and drag the [Expenses Record] data pill from the right-hand pane.
      • Table: Set to Expenses [x_expenses_getting_expenses].
      • Approval Field: Set to Approval.
      • Journal Field: Set to Approval history.
b) Define the rules in the Ask for Approval step.

- [Approve] when [Anyone approves] from the field [Trigger->Expenses Record->Requested for->Manager], [OR]
- [Anyone approves] from the [Manual User(s)] list. Select to allow a manual approver to process an approval or rejection. A manual approver is a user manually added to the Approvers related list who can then approve the request. For example, you can manually add a subject matter expert to a task to approve the request. To learn more about adding manual approvers, see Generate approvals using the approvers related list on page 2422.

Select Add another OR rule set to define rejection rules. When defining approvals, make sure to include rejection rules to avoid creating flows that remain in a waiting state if there are no matching approval rules.

- [Reject] when [Anyone rejects] from the field [Trigger->Expenses Record->Requested for->Manager], [OR]
- [Anyone rejects] from the [Manual User(s)] list.
c) Define a due date to automatically approve, cancel, or reject an approval if the request is not
approved or denied by the designated time. Adding a due date ensures that the flow does not
remain in a waiting state.

- [Approve] if pending by [Relative date] [1][Days] from [Trigger->Expenses Record->Created].
- Days schedule [8-5 weekdays excluding holidays].

This due date automatically approves all requests that have not been approved or denied within
one day from when the request was created.

11. Click Save.
12. Test the flow using a record with an amount below the designated limit.
   a) From the flow, click Test.
      The Test flow modal appears.
   b) In the Record field, select a record you created in earlier steps that has value in the Amount field
      under the 100.00 limit. This field is a reference to the table defined in the trigger.

      **Note:** Testing a flow bypasses the trigger conditions and immediately runs it. To test a
      flow with a record-based trigger, you must select a specific record to act as the trigger.

c) Select Run Test.
d) After the flow executes, click Flow has been executed. To view the flow, click here.
The Execution Details open.

Because the amount is less than 100.00, the first condition is met and the request is approved.

13. Navigate back to the flow and run the test again using a record with an amount over the designated amount.

14. After the flow executes, open the flow Execution Details.
   Because the amount is over the designated limit, the request must be approved. Until a manager or a manual approver approves the request, the state is Waiting.
15. Approve the request. In an active flow, a user from the Approvers list would approve or reject the request. However, because the flow is being tested, an admin can approve the flow.

   a) Navigate to the test record.
      The associated manager appears in the Approvers related list with Requested in the State field. Alternatively, you can edit the list to add manual approvers.
   
   b) Change the value of the State field in the Approvers related list to Approved.
   
   c) Navigate back to the flow Execution Details and refresh the browser.
      Because the request is approved, the flow completes.
Transform the Ask for Approval action into a reusable action using Action Designer. Actions enable flow designers to add complex actions to multiple flows with minimal configuration. See Getting started with actions on page 1225.

Getting started with actions

Transform the Ask for Approval action into a reusable action that always requires manager approval.

Role required: admin

Note: While Action Designer is designed to use the action_designer and delegated_developer roles in most scenarios, this tutorial uses the admin role to illustrate functionality without requiring additional roles to set up records and approve requests.

Complete the steps in Getting started with flows on page 1216. This tutorial replaces the Ask for Approval action in the Expense Approval flow.

Actions are made up of:

- Inputs: Data variables used in your action.
• Steps: Operations on the inputs or results from a prior step that generate data that can be used in later steps.
• Outputs: Data variables that represent the results of the action. These results are available to other actions in a flow.

Unlike the core Ask for Approval action where flow designers must manually configure the approval rules, this custom action always uses the same approval rules when added to a flow. You might create a reusable action if your flow designers often use an action with the same configuration. For example, if your flow designers always use the request manager approval and due date options, this action automatically uses them and therefore requires less flow configuration.

1. Open the Expenses Getting Started application in Studio.
   Alternatively, you can navigate to Flow Designer and select New Action to access Action Designer in the platform. In the Action Properties, select your scoped application in the Application field.

2. Create an action.
   a) Click Create Application File.
   b) Under Flow Designer, select Action and click Create.
   c) In the Name field, enter Ask for Manager Approval.
   d) In the Description field, enter Approve or reject a request based on manager approval or rejection. Allow manual approvers to be added.
   e) Click Submit.
   An Ask for Manager Approval action is created in the Expenses Getting Started scope.

3. Define the inputs in the Ask for Manager Approval action.
   a) Select + Create Input and add the following values.
      • Name: Request
      • Type: Reference
      • Reference Table: Expenses [x_expenses_getting_expenses]
This input enables you to reference any field or record from the Expenses table. Use the data pills on the right-hand side to add the record or its fields to action steps.

4. Add an Ask for Approval step.
   a) Click the + underneath Inputs in the Action Outline.
   b) Select Ask for Approval.
   c) Complete the fields in the Ask for Approval step.
      • Record: Under the Input Variables category, drag the [Request] data pill from the right-hand pane.
      • Table: Set to Expenses [x_expenses_getting_expenses].
      • Approval Field: Set to Approval.
      • Journal Field: Set to Approval history.

   d) Define rules in the Ask for Approval step. You can use the data pill picker, or drag the data pills from the right-hand pane to select the data you need.
      • [Approve] when [Anyone approves] from the field [action->Request->Requested for->Manager], [OR]
      • [Anyone approves] from the field [Manual User(s)].

   Select Add another OR rule set to define rejection rules:
      • [Reject] when [Anyone rejects] from the field [action->Request->Requested for->Manager], [OR]
      • [Anyone rejects] from the field [Manual User(s)].
e) Define a due date in the Ask for Approval step.
   - [Approve] if pending by [Relative date] 1 [Days] from [action->Request->Created].
   - Days schedule [8-5 weekdays excluding holidays].

   This due date automatically approves all requests that have not been approved or denied within one day from when the request was created.

5. Define the outputs in the Ask for Manager Approval action. Adding an output makes data available to a flow. For example, this action outputs the approval state of the record.
   a) Select + Create Outputs and add the following values.
      - Name: Approval state
- Value: In the right-hand pane, expand the Ask for Approval step category and drag the [Approval State] data pill.

![Ask for Manager Approval Action](image)

b) Click Save.

6. Add a custom icon for your application that displays in Flow Designer. All actions in the application scope use the custom icon.
   a) In Studio, navigate to File Settings. The application settings open.
   b) In the Logo field, select Click to add....
   c) Upload an icon to use with your reusable actions.

7. Test the reusable action within your flow.
   a) Return to the Expense Approval flow.
   b) Remove the 2.1 Ask for Approval action from the flow. This action will be replaced by the reusable Ask for Manager Approval action.
   c) Set Show draft actions to true.
   d) Add the Ask for Manager Approval action to your flow.
   e) In the right-hand pane, expand the Trigger - Record Created category and drag the [Expenses Record] data pill into the Request [Expenses] field.
8. Click Save.
9. Test the flow using a record with an amount below the designated limit.
   a) From the flow, click Test. The Test flow modal appears.
b) In the Record field, select a record you created in earlier steps that has value in the Amount field under the 100.00 limit. Verify that you have not already run tests using this record.

c) Select Run Test.

d) After the flow executes, click Flow has been executed. To view the flow, click here. The Execution Details open.

Because the amount is less than 100.00, the first condition is met and the request is approved. The Else condition is not evaluated.

<table>
<thead>
<tr>
<th>Execution Details</th>
<th>Expense Approval</th>
</tr>
</thead>
</table>

Show Action Details

FLOW STATISTICS

TRIGGER

[Expenses] Created

Open Current Record

Open Flow Logs

ACTIONS

1. If ( Trigger → Expenses Record → Amount less than 100.00 ) then

1.1 Update Record

2. Else

2.1 Ask for Manager Approval

10. Test a record with an amount over the designated limit. Verify that you have not already run a test on the test record.

Because the amount is over the designated limit, the second condition is evaluated.
11. Approve the request.
   a) Navigate to the test record and change the value of the State field in the Approvers related list to Approved.
   b) Navigate back to the flow execution details and refresh the browser. Because the request is approved, the flow completes.
12. Navigate to the Ask for Manager Approval action and click Publish. Publishing an action enables you to activate any flow that uses it.

13. Navigate to the flow and set Show draft actions to false.

14. Click Activate. Activating a flow sets it to run every time the trigger conditions are met.

The Expense Approval flow runs every time a record is created in the Expenses table. Now that the flow is activated and working as expected, you can publish it to the application repository and deploy it to other instances.

Flow Designer landing page

Access or create flows, actions, or flow executions.

**Flows**

The Flows screen contains all the flows that your installation of Flow Designer can use. Selecting a flow opens the flow in a new tab. You can see the scope the flow was created in, the internal name of the flow, whether the flow is published or in draft status, whether the flow is active, and update information.
Subflows
The Subflows screen contains all the subflows that your installation of Flow Designer can use. Selecting a subflow opens the subflow in a new tab. You can see the scope the subflow was created in, the internal name of the subflow, whether the subflow is published or in draft status, whether the subflow is active, and update information.

Actions
The Actions screen contains all the actions that your installation of Flow Designer can use. Selecting an action opens the action in a new tab. You can see the scope the action was created in, where the action is accessible from, whether the action is active, and update information.

Flow Executions
The Flow Executions screen shows a history of flow runs, including the current state and duration of the run.

Help
The Help landing page contains links to Flow Designer Guided Tour, Documentation, Videos, and Community Discussion.

+ New
You can create a new flow or action by selecting an action from the list.

Flow Designer roles
Grant users one or more Flow Designer roles to enable them to create flows, create actions, or see flow execution details.

<table>
<thead>
<tr>
<th>Role title [name]</th>
<th>Description</th>
<th>Contains Roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>flow_designer</td>
<td>Enables a user to launch the Flow Designer design environment to create and edit flows.</td>
<td>flow_operator</td>
</tr>
<tr>
<td>Role title [name]</td>
<td>Description</td>
<td>Contains Roles</td>
</tr>
<tr>
<td>------------------</td>
<td>-------------</td>
<td>----------------</td>
</tr>
<tr>
<td>flow_operator</td>
<td>Enables a user to view flow execution details, dashboards, and logs. Administrators can grant this role to users they want to be able to view flow results but not create, change, or test them.</td>
<td>none</td>
</tr>
<tr>
<td>action_designer</td>
<td>Enables a user to launch the Action Designer design environment to create and edit actions.</td>
<td>none</td>
</tr>
</tbody>
</table>

**Flow Designer system properties**

Configure how the system processes flows.

These properties are available for Flow Designer.

To set Flow Designer system properties, click Flow Designer Properties or navigate to the System Properties [sys_properties] table.

**Table 448: Properties for Flow Designer**

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable flow engine debug messages in the system log</td>
<td>Enable or disable logging Flow Designer debug messages in the system log. All debug messages start with a Flow Designer: string prefix.</td>
</tr>
<tr>
<td>com.glide.hub.flow_engine.debug</td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: false</td>
</tr>
<tr>
<td></td>
<td>• Location: Flow Designer Properties</td>
</tr>
<tr>
<td></td>
<td>• Learn more: Architecture Overview on page 1208</td>
</tr>
<tr>
<td>Number of times that a flow or subflow can be indirectly triggered during a transaction.</td>
<td>Specify the maximum number of times a flow or subflow permits indirect recursion. Flow Designer ignores all further calls or trigger condition matches from indirect recursion after the limit has been reached. Set the value to any integer equal to or greater than one. The system ignores any property value less than one and instead uses a limit of one. Set the value to one to prevent all indirect recursion.</td>
</tr>
<tr>
<td>com.glide.hub.flow_engine.indirect_recursion_limit</td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 3</td>
</tr>
<tr>
<td></td>
<td>• Location: Flow Designer Properties</td>
</tr>
<tr>
<td></td>
<td>• Learn more: Architecture Overview on page 1208</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Maximum actions per flow. sn_flow_designer.max_actions | Specify the maximum number of actions a flow or subflow can contain. Flow Designer prevents you from adding further actions after the maximum number of actions has been reached. Consider the performance impact raising the maximum number of actions may have. For example, running more actions may conflict with the default transaction quota rule that prevents flows from running longer than an hour.  
  - Type: integer  
  - Default value: 50  
  - Location: Flow Designer Properties  
  - Learn more: [Architecture Overview](#) on page 1208 |
| Maximum steps per action. sn_flow_designer.max_action_steps | Specify the maximum number of steps that an action can contain. Flow Designer prevents you from adding further steps after the maximum number of steps has been reached. Consider the performance impact raising the maximum number of steps may have. For example, running more steps may conflict with the default transaction quota rule that prevents flows from running longer than an hour.  
  - Type: integer  
  - Default value: 20  
  - Location: Flow Designer Properties  
  - Learn more: [Architecture Overview](#) on page 1208 |
| Disable the flow execution details.  
  com.snc.process_flow.reporting.enabled | Prevents a flow from reporting flow execution details. To disable the flow execution details, add the com.snc.process_flow.reporting.enabled system property to the System Properties [sys_properties] table and set the value to false. If disabled, details are not saved for actions in the flow. However, the flow context record and related log messages are available. If a flow runs while the property is false, execution details are never available for the flow, even if the property value changes. If a flow runs while the property is true, execution details are always available for the flow, even if the property value changes.  
  - Type: true | false  
  - Default value: true  
  - Location: System Properties [sys_properties] table  
  - Learn more: [Flow execution details](#) on page 1318 |
<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truncate runtime values in the flow execution details step configuration.</td>
<td>Specify the number of bytes allowed for runtime values in each step in the flow execution details. To prevent truncation, set the value to an integer equal to or less than zero.</td>
</tr>
<tr>
<td>com.snc.process_flow.reporting.serialized.val_size_limit</td>
<td>Type: integer</td>
</tr>
<tr>
<td></td>
<td>Default value: 16384</td>
</tr>
<tr>
<td></td>
<td>Location: System Properties [sys_properties] table</td>
</tr>
<tr>
<td></td>
<td>Learn more: Flow execution details on page 1318</td>
</tr>
</tbody>
</table>

**Flows**

Automate processes with a sequence of reusable actions such as manage records, ask for approvals, create tasks, and send notifications. Define trigger conditions to start a flow and variables to pass information between actions.

All flows consist of properties, a trigger, a sequence of actions, and the data collected or created.

**Flow properties**

The flow properties specify the flow name, application, description, and status. Flow designers can update the flow name and description at any time, but can only set the application during flow creation. The flow status is set when you save or activate a flow.

**Triggers**

The trigger specifies the conditions that start the flow. When the trigger condition is true, the system starts the flow.

Flow Designer supports record-based, schedule-based, and application-based trigger types. For detailed descriptions of trigger types, see Flow trigger types on page 1239.

**Actions**

Within Actions, flow designers can add actions, flow logic, subflows, or other flows.

Each action is a set of reusable business logic that produces a specific outcome when provided with its input values. Flow designers configure actions by specifying where they go in a flow sequence and by selecting the data they use as input values. As a flow runs, actions earlier in the sequence generate outcomes or output values that become available as data to actions later in the flow.

By default, the system provides a collection of core actions that can be added to any flow. Core actions cannot be viewed or edited from the Action Designer interface. Some applications include spokes which add application-specific flows and actions. Spoke actions are typically read-only but can be copied and customized. Developers may also create their custom actions from the Action Designer interface.
Flow data

Flows store any data gathered or generated as variables in the Data pane. Each variable has its own pill that Flow designers can use to drag-and-drop the variable value to an action input or output. Flow Designer generates the pill name based on the contents and its data type. The system specifies the variable data type next to the pill.

Figure 279: Example flow data

Flow logic

Flows may contain flow logic to specify conditional or repeated actions. The system provides these flow logic options.
### Table 449: Available flow logic

<table>
<thead>
<tr>
<th>Flow logic</th>
<th>Description</th>
</tr>
</thead>
</table>
| For Each   | Applies actions to each record in a list of records. Flow designers must specify the list of records from the flow data.  
  
  **Note:** Add a For Each flow logic block inside of another to repeat an action over a series of records. However, avoid nested For Each loops that process many records. Nested loops may cause the flow to run until stopped by the flow transaction quota rule, which prevents flows from running longer than an hour. For more information about transaction quotas, see *Transaction quotas.* |
| If         | Applies actions when a list of conditions is met. Flow designers can use flow data to specify the conditions. |

**Testing flows**

After adding a trigger and one or more actions, flow designers can test a flow. Testing a flow sets the trigger conditions to true and runs all actions. For flows that have record-based triggers, flow designers may specify an existing test record to use as input. Flow designers should always test flows on non-production instances containing relevant demonstration data since testing a flow creates or changes records on the instance.

**Flow execution details**

The system generates flow execution records, log messages, and reports for each flow run. The flow context is a related record containing the current state and runtime values of the flow. The system generates a context record each time a flow is run.

**Roles**

To access Flows, a user must have the flow_designer or admin roles.

**Flow trigger types**

The trigger specifies the conditions that start the flow. When the trigger condition is true, the system starts the flow.
Record triggers

<table>
<thead>
<tr>
<th>Trigger</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Created</td>
<td>Starts a flow when a record is created in a specific table.</td>
</tr>
<tr>
<td>Updated</td>
<td>Starts a flow when a record is updated in a specific table. Requires selecting whether to always run the trigger or to only run it once.</td>
</tr>
<tr>
<td>Created or Updated</td>
<td>Starts a flow when a record is either created or updated in a specific table. Requires selecting whether to always run the trigger or to only run it once.</td>
</tr>
</tbody>
</table>

**Note:** Flows including approval actions should only run the trigger once.

Scheduled triggers

**Note:** Because flows are processed asynchronously, a flow with a scheduled trigger may not run at the exact time its trigger conditions were met. For example, if a scheduled flow is triggered during core business hours, the system may have to process other events in the queue before it can run the scheduled flow.

<table>
<thead>
<tr>
<th>Trigger</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>Starts a flow at a specific time every day.</td>
</tr>
<tr>
<td>Weekly</td>
<td>Starts a flow at a specific time every week.</td>
</tr>
<tr>
<td>Monthly</td>
<td>Starts a flow at a specific time every month.</td>
</tr>
<tr>
<td>Run Once</td>
<td>Starts a flow once at a specific time but does not repeat. If you select a past date or time, the system schedules the flow to run as soon as possible.</td>
</tr>
<tr>
<td>Repeat</td>
<td>Starts a flow at regular intervals you define.</td>
</tr>
</tbody>
</table>

Application triggers

<table>
<thead>
<tr>
<th>Trigger</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MetricBase</td>
<td>Starts a flow when a MetricBase trigger is met. Requires the MetricBase application. For more information, see [Create a flow with a MetricBase trigger](page 1243).</td>
</tr>
<tr>
<td>Service Catalog</td>
<td>Starts a flow from a Service Catalog item request. For more information, see [Create a flow with a Service Catalog trigger](page 1244).</td>
</tr>
</tbody>
</table>
Create a flow

Automate a process to run one or more actions when a trigger condition occurs.

- Role required: flow_designer or admin
- Create a custom application to store Flow Designer content.

Flow designers should know the application table structure and be aware of any existing business logic associated with the target tables of a flow or subflow. Be sure to disable any conflicting business rules or workflows before creating a flow or subflow.

Creating a custom application to contain your Flow Designer content allows you to deploy it using the application repository or the ServiceNow Store.

1. Navigate to Flow Designer Designer .
3. Fill in the following properties.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Create a name for your flow. The system computes the internal name of the flow from the name.</td>
</tr>
<tr>
<td>Application</td>
<td>Select the application scope to create your flow in. Global is the default.</td>
</tr>
<tr>
<td>Description</td>
<td>Add a description of your flow.</td>
</tr>
<tr>
<td>Protection</td>
<td>Select whether the flow is read-only. You can only select a value when you create the flow in an application scope you own.</td>
</tr>
</tbody>
</table>

The system displays the flow designer page.

4. Add a trigger.
   a) Click Click to add a trigger. The system displays the trigger choice list.
   b) Select the type of trigger.
      For more information on trigger types, see Flow trigger types on page 1239. The system displays a set of fields depending on the type of trigger you selected.
      a) Fill in the fields to specify the trigger. For a record-based trigger, for example, fill in the table and conditions.
      b) Click Done.

5. Add actions, flows, subflows, or flow logic.
   a) Under Actions, click + and select an option.
Option | Description
--- | ---
Action | Select the desired action. Flow Designer includes a set of Actions on page 1255 available to flows and subflows. Alternatively, an action designer can create additional actions to add to flows. The IntegrationHub on page 1327 and spoke plugins install additional actions.

To add draft actions, set Show draft actions to true from the More Actions menu.

Flow Logic | Select an option to specify conditional or repeated operations.

Subflow | Select a published subflow and define input values. In addition to adding a subflow as a flow action, you can enable the Show triggered flows option from the More Actions menu to select an activated flow and define the required inputs. Running a triggered flow ignores its trigger conditions and runs all actions.

To change the order of an action in a flow, drag-and-drop the handle on the left side of the action.

The system displays a set of fields depending on the option selected.

b) Fill in the fields to configure the action, flow, or subflow.
c) Click Done.
d) Repeat adding actions until complete.

6. Click Save.

Flow Designer saves a draft of the flow, trigger, and actions.

Test the flow until it is ready to be activated.

**Note:** The system only triggers active flows.

### Request Flow Designer support for the Service Catalog

To activate this feature, request the Flow Designer support for the Service Catalog plugin (com.glideapp.servicecatalog.flow_designer) through the HI Customer Service system. This plugin activates related plugins if they are not already active.

Role required: none

1. In the HI Service Portal, click Service Requests Activate Plugin.

2. Fill out the form.

<table>
<thead>
<tr>
<th>Target Instance</th>
<th>Instance on which to activate the plugin.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plugin Name</td>
<td>Name of the plugin to activate.</td>
</tr>
</tbody>
</table>
Specify the date and time you would like this plugin to be enabled

Date and time must be at least 2 business days from the current time.

**Note:** Plugins are activated in two batches each business day in the Pacific time zone, once in the morning and once in the evening. If the plugin must be activated at a specific time, enter the request in the Reason/Comments.

Reason/Comments

Provide any information that would be helpful for the ServiceNow personnel activating the plugin. For example, if you need the plugin activated at a specific time instead of during one of the default activation windows.

3. Click Submit.

**Create a flow with a MetricBase trigger**

Start a flow when a MetricBase trigger is met. MetricBase triggers track time series data and can monitor when a threshold is reached, when a trend is detected, or when a system stops reporting data.

Role required: flow_designer or admin

MetricBase triggers are not available on the base system. The MetricBase application requires a separate subscription and must be activated by ServiceNow personnel.

1. Navigate to Flow Designer Designer.
2. Click + New New Flow.
3. Define the flow properties.
   
   For more information, see *Create a flow* on page 1241.

4. In the Trigger section, add a trigger and select MetricBase.

5. Complete the trigger fields.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MetricBase Trigger</td>
<td>Select or create a MetricBase trigger record to start the flow. For types of MetricBase triggers, see <em>MetricBase triggers</em> on page 1567.</td>
</tr>
<tr>
<td>Table</td>
<td>Read-only table that contains the metric.</td>
</tr>
<tr>
<td>Condition</td>
<td>Click Add filters to set field-based conditions that determine when the flow runs.</td>
</tr>
<tr>
<td>Condition Script</td>
<td>Define a script in the Additional MetricBase Trigger Filtering and Moderation table to prevent duplicate metric events from re-triggering a flow. For example, if a metric hovers at a defined trigger threshold, create a script that defines whether to run the flow once when the metric is met, or every time the triggering threshold is exceeded.</td>
</tr>
</tbody>
</table>

6. Add actions, subflows, and flow logic to the flow.
7. Test the flow. Once behaving as desired, activate the flow.
For more information, see Test a flow on page 1253 and Activate a flow on page 1252.

The MetricBase application monitors time series data on the Now Platform. When the selected trigger is met, the flow runs.

**Create a flow with a Service Catalog trigger**

Start a flow when a Service Catalog item is requested to automate the fulfillment process. To activate this feature, request the Flow Designer support for the Service Catalog plugin (com.glideapp.servicecatalog.flow_designer) through the HI Customer Service system. This plugin activates related plugins if they are not already active.

Role required: flow_designer or admin

Unlike a record trigger which runs on all records in a table, the Service Catalog trigger runs on all catalog item requests for a specific item when the catalog item is configured to run a specific flow. For example, you can define a flow that runs every time there is a request for a tablet. The requested item becomes the flow trigger record.

1. If not already created, create the catalog item to associate with the flow.
   a) Navigate to Service Catalog Definition Maintain Items.
      The Catalog Items [sc_cat_item] table opens.
   b) Click New.
   c) Complete the fields.
      For a detailed description of catalog item fields, see Create or edit a catalog item.
   d) Configure the form to add the Flow field.
      If you plan to add stages to the flow, verify that there is not an existing workflow associated with the item that also has stages. Clear the values of the Workflow and Execution Plan fields to prevent conflicting stages from reporting to the requested item stage field.

2. Create the flow to associate with the catalog item. When triggered, this flow processes the catalog item request.
   a) Navigate to Flow Designer Designer.
   b) Click + New New Flow.
   c) Define the flow properties.
      For more information, see Create a flow on page 1241.
   d) In the Trigger section, add a trigger and select Service Catalog.
   e) Create flow-specific catalog variables available only to flow actions. See Create flow Service Catalog variables on page 1245.
   f) Add actions, subflows, and flow logic to the flow.
      Some actions enable you to manage catalog items. For example, the Create Catalog Task action generates a task for the requested item, and the Get Catalog Variables action enables you to access catalog variables as data pills in the flow. See Create Catalog Task action on page 1259 and Get Catalog Variables action on page 1263.
   g) Add stages to the flow to report progress to the requester.
      See Flow Designer stages on page 1271.
   h) Test the flow. Once behaving as desired, activate the flow.
      For more information, see Test a flow on page 1253 and Activate a flow on page 1252.
3. Add the flow to the Flow field of the catalog item you created.
   a) Navigate to the catalog item.
   b) In the Flow field, select the flow you created.

   **Note:** The Flow field only displays flows with a Service Catalog trigger.

   c) Click Update.

When the catalog item is requested, the associated flow triggers and runs the actions.

**Create flow Service Catalog variables**

Create Service Catalog variables that are only available to a specific Service Catalog-triggered-flow. Flow-specific variables are available to catalog tasks and actions in the flow.

Role required: flow_designer or admin

To activate this feature, request the Flow Designer support for the Service Catalog plugin (com.glideapp.servicecatalog.flow_designer) through the HI Customer Service system. This plugin activates related plugins if they are not already active.

Flow Service Catalog variables display in the Catalog Variables field of the Create Catalog Task and Get Catalog Variables actions. They display in the Flow:variablename format and are only available to the flow in which they are defined.

For more information about Service Catalog actions, see *Create Catalog Task action* on page 1259 and *Get Catalog Variables action* on page 1263.

1. Open or create a flow with a Service Catalog trigger.
2. Click ![Flow icon] and select Manage flow catalog variables. The Flow catalog variables table opens.
3. Click New to add a new variable available to the flow.
4. Complete the form.

**Table 450: Variable form**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>The variable type that you want to create.</td>
</tr>
<tr>
<td>Application</td>
<td>Read-only field that indicates which applications can use this variable.</td>
</tr>
<tr>
<td>Catalog item</td>
<td>Catalog item using the variable.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Check box to make the variable mandatory as part of the ordering process.</td>
</tr>
<tr>
<td>Active</td>
<td>Check box to make the variable available for use</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Selection Required</td>
<td>Check box to require users to select the check box variable. For example, use this option to require users to select an I agree check box for an agreement form. If users try to submit the agreement form without selecting the check box, an alert message is displayed to tell users that they must select the check box.</td>
</tr>
<tr>
<td>Order</td>
<td>Order that the variable is placed on the page for the catalog item. The variables are organized from top to bottom from least to greatest order value. For example, a variable with an order value of 1 is placed above other variables with higher-order values.</td>
</tr>
<tr>
<td>Global</td>
<td>If selected, the variable is available for all catalog tasks within service catalog workflows or execution plans by default. If deselected, the variable must be associated with individual catalog tasks.</td>
</tr>
<tr>
<td>Map to field</td>
<td>Maps the variable to a specific field on the table for the record producer. This field appears if the variable belongs to a record producer.</td>
</tr>
<tr>
<td>Field</td>
<td>Field that the variable maps to. This field appears if the variable belongs to a record producer.</td>
</tr>
<tr>
<td>Record producer table</td>
<td>Table that the record producer creates a record in. This field appears if the variable belongs to a record producer.</td>
</tr>
<tr>
<td>Question</td>
<td>Question to ask users ordering the catalog item.</td>
</tr>
<tr>
<td>Name</td>
<td>A name to identify the question.</td>
</tr>
<tr>
<td>Tooltip</td>
<td>Tooltip text to display when users point to the variable. Enter a brief note to describe the purpose of the 'Question'.</td>
</tr>
</tbody>
</table>

**Note:** If this field is empty, its value is auto-populated based on the Question field for all variable types except break, container split, and container end.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example text</td>
<td>Hint that is displayed in the question field before a user enters a value. Applicable for the following variables: • IP Address • Email • URL • Single Line Text • Wide Single Line Text • Multi Line Text • Date • Date/Time</td>
</tr>
<tr>
<td>Annotation</td>
<td></td>
</tr>
<tr>
<td>Show help</td>
<td>If selected, displays the help text for the variable.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> It is not available for break and check box variables.</td>
</tr>
<tr>
<td>Always Expanded</td>
<td>If selected, the Help text field value is expanded by default when the catalog item page loads. This check box appears only when the Show help check box is selected.</td>
</tr>
<tr>
<td>Help tag</td>
<td>If the Always Expanded check box is deselected, click the value specified in this field to display the Help text field value.</td>
</tr>
<tr>
<td>Help text</td>
<td>Help information for a service catalog variable.</td>
</tr>
<tr>
<td>Instructions</td>
<td>Information that requires rich text formatting or adding images to support help information.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> For HTML tables, use sizes that are within the width of the variable.</td>
</tr>
<tr>
<td>Type Specifications (The fields in this section vary for each variable type)</td>
<td></td>
</tr>
<tr>
<td>Variable Width</td>
<td>Width for the variable on the catalog item page, to specify what percentage of the screen size that it can span. For details, see Configure a default width for service catalog variables. This field appears for all variable types except for break, container end, container start, container split, container layout, and label variables.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Choice direction</td>
<td>The direction in which the choice list is arranged.</td>
</tr>
<tr>
<td></td>
<td>• Across: Arranges choices horizontally.</td>
</tr>
<tr>
<td></td>
<td>• Down: Arranges choices vertically.</td>
</tr>
<tr>
<td></td>
<td>This field appears for lookup multiple choice variables.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> The selected direction is also applicable in Service Portal.</td>
</tr>
<tr>
<td>Choice field</td>
<td>Table field to populate options for the variable. If no choices are defined for a field, then the variable loads field-related distinct values from the table. This field appears for select box variables.</td>
</tr>
<tr>
<td>Choice table</td>
<td>Table with values to populate in the Choice field. This field appears for select box variables.</td>
</tr>
<tr>
<td>Do not select the first choice</td>
<td>Check box to leave all options for the variable cleared on the catalog item page. If this check box is selected, the first choice for the variable selected by default. This field appears for multiple choice and numeric scale variables.</td>
</tr>
<tr>
<td>Dynamic ref qual</td>
<td>Dynamic qualifier. Select a dynamic filter to run a query against the reference field. This field appears for reference variables when Use reference qualifier is set to Dynamic.</td>
</tr>
<tr>
<td>Include none</td>
<td>Check box to include the None option in a list of choices. This field appears for lookup multiple choice, lookup select box, multiple choice, and select box variables.</td>
</tr>
<tr>
<td>Layout</td>
<td>Layout for a container, whether one or two columns. This field appears for container start variables.</td>
</tr>
<tr>
<td>List table</td>
<td>Table with the values for the list collector. This field appears for list collector variables.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Lookup from table</td>
<td>Table from which values are obtained for users to select. The values from this table are populated in the Lookup value field. This field appears for lookup multiple choice and lookup select box variables.</td>
</tr>
<tr>
<td>Lookup value field</td>
<td>Field in the lookup table that populates options for the variable. This field appears for lookup multiple choice and lookup select box variables.</td>
</tr>
<tr>
<td>Lookup label field(s)</td>
<td>Comma-separated list of fields in the lookup table whose values are used to display options. This field appears for lookup multiple choice and lookup select box variables.</td>
</tr>
<tr>
<td>Lookup price field</td>
<td>Field in the lookup table whose value is used to modify the price of the item being ordered. This field appears for lookup multiple choice and lookup select box variables.</td>
</tr>
<tr>
<td>Lookup recurring price field</td>
<td>Field in the lookup table whose value is used to modify the recurring price of the item being ordered. This field appears for lookup multiple choice and lookup select box variables.</td>
</tr>
<tr>
<td>Macro</td>
<td><strong>UI macros</strong> to insert into the catalog item. This field appears for macro, macro with label, and UI page variables.</td>
</tr>
<tr>
<td>Summary macro</td>
<td>Applicable only for Marco, and Macro with Label type variables.</td>
</tr>
<tr>
<td>Widget</td>
<td>Applicable only for Marco, and Macro with Label type variables.</td>
</tr>
<tr>
<td>Price if checked</td>
<td>Price of the item. This field appears for check box variables.</td>
</tr>
<tr>
<td>Recurring price if checked</td>
<td>Price that increments for the item, when the user requests more than one order of the item. This field appears for check box variables. For more information about prices and recurring prices, see <em>Using variables for price setup.</em></td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Reference</td>
<td>Reference table for the variable. This field appears for reference variables.</td>
</tr>
<tr>
<td>Reference qual</td>
<td>Qualifiers to restrict data that is available in the field. Supports reference qualifiers and advanced reference qualifiers. Returns all matching results (no maximum).</td>
</tr>
<tr>
<td>Note:</td>
<td>For security reasons, the use of scripts in the Reference qual field is restricted to system administrators through the Allow javascript in Default Value business rule.</td>
</tr>
<tr>
<td>This field appears for list collector, lookup multiple choice, and lookup select box variables. reference variables. It appears for reference variables when Use reference qualifier is set to Dynamic.</td>
<td></td>
</tr>
<tr>
<td>Reference qualifier condition</td>
<td>Options to build conditions. This field appears for reference variables when Use reference qualifier is set to Simple.</td>
</tr>
<tr>
<td>Scale max</td>
<td>Highest value on the scale of available options for the variable. This field appears for numeric scale variables.</td>
</tr>
<tr>
<td>Scale min</td>
<td>Lowest value on the scale of available options for the variable. This field appears for numeric scale variables.</td>
</tr>
<tr>
<td>Unique values only</td>
<td>Check box to require a unique value for the field. When this check box is selected, two records cannot have the same value for that field. This field appears for lookup multiple choice, lookup select box, and select box variables.</td>
</tr>
<tr>
<td>Use confirmation</td>
<td>Check box to prompt users to reenter data to verify their entries. This field appears for masked variables.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Use encryption</td>
<td>Check box to store the answer in encrypted format in the database. If not encrypted, the answer is stored in plain text format. Encryption uses Triple DES with system encryption. This field appears for masked variables.</td>
</tr>
<tr>
<td>Use reference qualifier</td>
<td>Type of qualifier to use. This field appears for reference variables.</td>
</tr>
<tr>
<td>Default Value</td>
<td></td>
</tr>
<tr>
<td>Default value</td>
<td>Default value for the variable.</td>
</tr>
<tr>
<td>Variable attributes</td>
<td>Attributes for this variable.</td>
</tr>
<tr>
<td>Permission</td>
<td>If no role is specified in this tab for the read, write, or create actions, all users who can access the catalog item can perform these actions irrespective of their role. For example, if no role is specified for the Write roles field, all users who can access the catalog item can edit the variable value in the variable editor. A user with a role that does not match any of the following roles cannot set variable values even through scripting.</td>
</tr>
<tr>
<td>Read roles</td>
<td>Roles that can view the variable before or after requesting the catalog item or record producer. Only a user with the roles specified in this field can view the variable.</td>
</tr>
<tr>
<td>Write roles</td>
<td>Roles that can edit the variable in the variable editor after requesting the catalog item or record producer. If a user does not have the roles specified in this field, the variable is read-only in the variable editor.</td>
</tr>
<tr>
<td>Create roles</td>
<td>Roles that can create values for the variable before requesting the catalog item or record producer. If a user does not have the specified role, the variable is read-only before requesting the catalog item or record producer.</td>
</tr>
<tr>
<td>Availability</td>
<td></td>
</tr>
<tr>
<td>Visible Elsewhere</td>
<td>If selected, the variable is visible in the item form before ordering the item, in VEditor after ordering the item, and in the cart view of the item.</td>
</tr>
<tr>
<td>Visible on Bundles</td>
<td>If selected, the variable is visible when the item is added to a bundle.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Visible on Guides</td>
<td>If selected, the variable is visible only when the item is added to an order guide.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> If an order guide has too many items and variables, consider clearing this check box on as many items as possible, to improve loading performance on order guides.</td>
</tr>
<tr>
<td>Visible on Summaries</td>
<td>If selected, the variable is visible on any variable summarizer of the catalog item. In Service Portal, the variable is visible in the RITM ticket view and the Approval page.</td>
</tr>
</tbody>
</table>

5. Click Submit.

Access the variable in the flow by adding a Create Catalog Task or Get Catalog Variables action.

**Activate a flow**

Activate a flow to make it available to other users.

Role required: flow_designer or admin

When you save a flow, you can test it, but no other users on the instance can see or run it. To make the flow available to other users, activate it.

1. Navigate to Flow Designer. 
2. Double click the row for the flow you want to display it on the flow designer page. 
3. Click Activate.

**Edit a flow**

Edit an existing flow.

Role required: flow_designer or admin

1. If necessary, navigate to Flow Designer, then double click the row for the flow you want to edit. The system displays the flow designer page.
2. Take the appropriate actions to edit the flow.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Change the flow name or description</strong></td>
<td>Click Edit Properties, enter the values you want into the appropriate fields, then click Update.</td>
</tr>
<tr>
<td><strong>Note:</strong> You cannot change the scope of an automationHub flow after you have saved it.</td>
<td></td>
</tr>
<tr>
<td><strong>To edit the trigger</strong></td>
<td>Click the trigger description, fill in the fields as desired, then click Done</td>
</tr>
<tr>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>To edit an existing action</strong></td>
<td>Click the action description, fill in the fields as desired, then click Done</td>
</tr>
<tr>
<td><strong>To add a new action</strong></td>
<td>Click the plus icon in the ACTION section then proceed as you would for adding an action to a new flow.</td>
</tr>
</tbody>
</table>

3. To save your changes, click Save.

**Delete a flow**
Delete a flow that you no longer need.
Role required: flow_designer or admin
You can only delete records that are in the same application scope as the current session.

1. If necessary, navigate to Flow Designer to display the flow designer page.
2. Check the selection box for the row corresponding to the flow you want to delete.
3. Click Actions on selected rows . . . , then click Delete.

**Test a flow**
Before activating a flow so other users can access it, test to make certain it works the way you expect.
Role required: flow_designer or admin. Save the flow.

1. If necessary, navigate to Flow Designer , then double click the row for the flow you want to test.
2. Click Test.
   The system displays the Test flow dialog. The contents of the Test flow dialog depend on the type of trigger: Data or Schedule. If the trigger is a Data trigger, the dialog asks for a record to use for the test.
3. If the trigger is a Data trigger, select a record to use for the test.
   When you test a flow, the system does not execute the trigger. In other words, for a trigger that fires when a record is added to a particular data, the test does not create a new record. It behaves as if a record was created. By selecting a record on the Test flow dialog, you are asking the system to act as if that record was just created.

**Allow flow designers to dynamically set field values**
Enable flow designers to dynamically set field values when adding the subflow or action to a flow. For example, allow flow designers to set the priority and short description of a Create Task action.
A dynamic field can only be created in a subflow action or action step that creates or updates a record, such as Create Catalog Task, Create Task, Create Record, and Update Record.
Role required: admin or action_designer
When creating or updating a record in a subflow action or action step, you can set static or dynamic values. A static value is the same every time a flow runs. A dynamic value allows a flow designer to change it
every time a flow runs. For example, setting the Urgency to the static value 1 - High generates an urgent catalog task every time the flow runs.

1. Open an action in Action Designer or a subflow in Flow Designer that you want to create a dynamic value for.
2. Create an input.
   a) In the Label field, enter a label to help flow designers understand the purpose of the field. This is the label for the field when the flow designer adds the subflow or action to a flow. For example, enter Select fields.
   b) In the Type field, select Template Value. Select the table containing the record you will create or update. For example, if you are adding a Create Catalog Task action in a subflow, set the Type to Template Value.Requested Item [sc_req_item].

3. Add an action step or action that will use the template value.
   The action step or action must create or update a record. For example, add a Create Task action to a subflow that will create an incident task.
4. Drag the Template Value data pill into the Field Values or Fields field.
5. Add static values in addition to the dynamic field by selecting + Add Field Value.

**Note:** Avoid setting static values that you want flow designers to set from the dynamic field. The flow always uses the static value from the subflow or action step over a value entered from a dynamic field. You can use static values to enforce business policies that you do not want flow designers to change.

When the subflow or action is added to a flow, a flow designer can set field values for the record being created or updated.
View activated flows for a table

View flows with record-based triggers that run on a specific table.

Role required: flow_designer or admin
1. Navigate to a table.
2. Right-click the form header and select Configure Flow Designer Flows.
   The Flows table opens and displays all flows that have been activated to run on the specified table.

Actions

Actions can be added to any flow, enabling process analysts to automate Now Platform features without having to write code.

An action is a reusable operation that enables process analysts to automate Now Platform features without having to write code. For example, the Create Record action allows process analysts to generate records in a particular table with particular values when certain conditions occur. Core actions like Create Record require some familiarity with Now Platform tables and fields. Action designers can create application-specific actions to pre-set configuration details. For example, creating a Create Incident Task action ensures that the process analyst uses the correct table and field configuration each time the action is used. You can add application-specific actions by activating the associated spoke.

In Flow Designer, a process analyst adds actions to a flow and defines the configuration options.

Core actions

A core action is a ServiceNow-provided action available to any flow that cannot be viewed or edited from the Action Designer design environment. For example, the Ask for Approval action is a core action that allows process analysts to use Now Platform approvals. Flow Designer provides a set of core actions to automate Now Platform processes. You can add application-specific core actions by activating the associated spoke.

Custom actions

Using a core action enables the process analyst to configure the desired behavior within the flow. To create an action with a pre-set configuration, or to define custom configuration options, a subject matter expert can create a custom action in Action Designer on page 1283.
**Action limit**

By default, flows can have no more than 50 actions. To change the default behavior, increase the value of the `sn_flow_designer.max_actions` system property. However, consider the performance impact that a large flow may have on your instance.

**Ask for Approval action**

Request approval for a record with an approval field. You can configure a rule set for an approval, rejection, or cancellation. If a due date is added to an approval, the approval is automatically approved, rejected, or canceled if the approvers have not responded by the designated time.

*Approvals on page 2404* is a platform feature that enables users or groups to approve or reject a task.

**Roles and availability**

- Available as a Flow Designer core action. Process analysts use the `flow_designer` role to add an action to a flow and define configuration details.

**Fields**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Record</td>
<td>Select a record under the data panel and drag the record pill into the Record field. If selecting a table with an approval field already configured, the Approval field is set to the correct field.</td>
</tr>
<tr>
<td>Table</td>
<td>Set to the table name associated with the record.</td>
</tr>
<tr>
<td>Approval field</td>
<td>Select a field from the designated table to use for approval.</td>
</tr>
<tr>
<td>Journal field</td>
<td>Select a field from the designated table to use for journal.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| Rules  | Define the approval and rejection rules. Approval rules determine which users can approve or reject requests, and what happens after approval or rejection. Approval or rejection rules include:  
- Anyone approves  
- All users approve  
- All responded and anyone approves  
- % of users approve  
- # of users approve  

In the field beside the approval rule, add the desired approvers. To add approvers:  
- Select individual users or groups.  
- Drag-and-drop or select a field from a record.  

Select ✍️ to allow a manual approver to process an approval or rejection. A manual approver is a user manually added to the Approvers related list who can then approve the request. For example, you can manually add a subject matter expert to a task to approve the request. To learn more about adding manual approvers, see Generate approvals using the approvers related list on page 2422.  

Define rejection rules by adding another OR rule set. When defining approvals, include rejection rules that run when there are no matching approvals. Such rejection rules prevent the flow from remaining in a waiting state. For example, if an approval can be approved by anyone, create a time-based rejection rule in case no one approves it. |
| Due Date | Define a due date to ensure that the flow does not remain in a waiting state if the request is not approved or denied.  
- None: The approval is not dependent on a specific date.  
- Approve: Automatically approve the step if an action is still pending by the specified date.  
- Reject: Automatically reject the step if an action is still pending by the specified date.  
- Cancel: Automatically cancel the step if an action is still pending by the specified date. |
Example

**TRIGGER**

[Incident] Created or Updated

**ACTION**

1. **Ask For Approval**

- **Action**: Ask For Approval
- **Record**: Trigger ➞ Incident Record
- **Table**: Incident [incident]
- **Approval Field**: Approval
- **Journal Field**: Approval history
- **Rules**
  - **Approve**: When: Anyone approves
  - **Reject**: When: Anyone rejects

- **Due Date**: Approve if pending by Relative date 1 Day From Trigger
- **Days schedule**: 8-5 weekdays
Create Catalog Task action

Creates a record in the Catalog Task [sc_task] table associated to a requested item in the Requested Items [sc_req_item] table. Adds the catalog task record as data to be used in the flow.

Roles and availability

- Available as a Flow Designer core action. Process analysts use the flow_designer role to add an action to a flow and define configuration details.

Fields

<table>
<thead>
<tr>
<th>Fields</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table Name</td>
<td>The Catalog Task [sc_task] table where the catalog task is created. This value is read only.</td>
</tr>
<tr>
<td>Requested Item [Requested Item]</td>
<td>The requested item record from the Requested Items [sc_req_item] table that this catalog task fulfills.</td>
</tr>
<tr>
<td>Short Description</td>
<td>Short description for the catalog task.</td>
</tr>
<tr>
<td>Fields [Catalog Task]</td>
<td>To add the action to a flow, set fields in the catalog task record to the desired value. For example, to set the Urgency, select Urgency and set the desired value. If adding the action to a subflow, you can allow flow designers to dynamically set field values.</td>
</tr>
<tr>
<td>Wait</td>
<td>Pauses the flow until this task completes and is no longer active (active=false). Alternatively, you can add a wait condition by dragging-and-dropping a true/false field from the data panel into the Wait field. The flow only waits for the task to complete when this field is true.</td>
</tr>
<tr>
<td>Template Catalog Item [Catalog Item]</td>
<td>Select an item from the Catalog Items [sc_cat_item] table to populate the Catalog Variables slushbucket with the associated variables.</td>
</tr>
<tr>
<td>Catalog Variables</td>
<td>Select catalog variables to show on the catalog task form to provide more information or allow the fulfiller to modify the variables. You can define flow-specific variables that display in the Available column. To define flow-specific variables, see Create flow Service Catalog variables on page 1245.</td>
</tr>
</tbody>
</table>
## Example

**TRIGGER**

**[Service Catalog]**

**ACTIONS**

<table>
<thead>
<tr>
<th>Action</th>
<th>Create Catalog Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table Name</td>
<td>Catalog Task [sc_task]</td>
</tr>
<tr>
<td>Requested Item (Requested Item)</td>
<td>Trigger ⇒ Requested Item Record</td>
</tr>
<tr>
<td>Short Description</td>
<td>Order from vendor or move from in-stock inventory</td>
</tr>
<tr>
<td>Fields (Catalog Task)</td>
<td>+ Add Field Value</td>
</tr>
<tr>
<td>Wait</td>
<td>✔</td>
</tr>
<tr>
<td>Template Catalog Item (Catalog Item)</td>
<td>Apple iPhone 5</td>
</tr>
</tbody>
</table>

### Catalog Variables

<table>
<thead>
<tr>
<th>Available</th>
<th>Selected</th>
</tr>
</thead>
<tbody>
<tr>
<td>data_plan</td>
<td>storage</td>
</tr>
<tr>
<td>color</td>
<td>carrier</td>
</tr>
<tr>
<td>duration</td>
<td>duration</td>
</tr>
</tbody>
</table>

[Delete] [Cancel] [Done]
Create Record action

Creates a record on any table. You can dynamically add and configure fields for the record.

Roles and availability

• Available as a Flow Designer core action. Process analysts use the flow_designer role to add an action to a flow and define configuration details.

Fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table</td>
<td>Select a table from the list.</td>
</tr>
<tr>
<td>Field Values</td>
<td>Set the values of fields in the record to be created. For example, to set the short description to a certain value, select Short description and set the desired value. If adding the action to a subflow, you can Allow flow designers to dynamically set field values on page 1253.</td>
</tr>
</tbody>
</table>

Create Task action

Create a task on any ServiceNow task table. After you choose the task table, you can dynamically select the fields to configure the action. Defining the Parent field associates the task to a parent record.

Roles and availability

• Available as a Flow Designer core action. Process analysts use the flow_designer role to add an action to a flow and define configuration details.
## Fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Table</strong></td>
<td>Select a task table.</td>
</tr>
<tr>
<td></td>
<td>• Catalog Task [sc_task]</td>
</tr>
<tr>
<td></td>
<td>• Change Phase [change_phase]</td>
</tr>
<tr>
<td></td>
<td>• Change Request [change_request]</td>
</tr>
<tr>
<td></td>
<td>• Chat Queue Entry [chat_queue_entry]</td>
</tr>
<tr>
<td></td>
<td>• Feature Task [release_task]</td>
</tr>
<tr>
<td></td>
<td>• Follow On Task [cert_follow_on_task]</td>
</tr>
<tr>
<td></td>
<td>• Group approval [sysapproval_group]</td>
</tr>
<tr>
<td></td>
<td>• Guided Setup Task [gsw_task]</td>
</tr>
<tr>
<td></td>
<td>• IMAC [change_request_imac]</td>
</tr>
<tr>
<td></td>
<td>• Incident [incident]</td>
</tr>
<tr>
<td></td>
<td>• Incident Task [incident_task]</td>
</tr>
<tr>
<td></td>
<td>• KB Submission [kb_submission]</td>
</tr>
<tr>
<td></td>
<td>• Orphan CI Remediation [orphan_ci_remediation]</td>
</tr>
<tr>
<td></td>
<td>• Private Task [vtb_task]</td>
</tr>
<tr>
<td></td>
<td>• Problem [problem]</td>
</tr>
<tr>
<td></td>
<td>• Problem Task [problem_task]</td>
</tr>
<tr>
<td></td>
<td>• Reclassification Task [reclassification_task]</td>
</tr>
<tr>
<td></td>
<td>• Recommended Field Remediation [recommended_field_remediation]</td>
</tr>
<tr>
<td></td>
<td>• Remediate Duplicate Task [reconcile_duplicate_task]</td>
</tr>
<tr>
<td></td>
<td>• Release Phase [release_phase]</td>
</tr>
<tr>
<td></td>
<td>• Renew Lease Task [statemgmt_renew_lease_task]</td>
</tr>
<tr>
<td></td>
<td>• Request [sc_request]</td>
</tr>
<tr>
<td></td>
<td>• Request new Knowledge Base</td>
</tr>
<tr>
<td></td>
<td>• [kb_knowledge_base_request]</td>
</tr>
<tr>
<td></td>
<td>• Requested Item [sc_req_item]</td>
</tr>
<tr>
<td></td>
<td>• Required Field Remediation [required_field_remediation]</td>
</tr>
<tr>
<td></td>
<td>• Security Case [sn_ti_case]</td>
</tr>
<tr>
<td></td>
<td>• Security Incident [sn_si_incident]</td>
</tr>
<tr>
<td></td>
<td>• Security Incident Response Task [sn_si_task]</td>
</tr>
<tr>
<td></td>
<td>• Security Request [sn_si_scan_request]</td>
</tr>
<tr>
<td></td>
<td>• Service Order [sm_order]</td>
</tr>
<tr>
<td></td>
<td>• Service Order Task [sm_task]</td>
</tr>
<tr>
<td></td>
<td>• Service Task [service_task]</td>
</tr>
<tr>
<td></td>
<td>• Stale CI Remediation [stale_ci_remediation]</td>
</tr>
<tr>
<td></td>
<td>• Standard Change Proposal [std_change_proposal]</td>
</tr>
<tr>
<td></td>
<td>• Ticket [ticket]</td>
</tr>
</tbody>
</table>

| Field Values           | Set the values of fields in the task to be created. For example, to set the short description to a certain value, select Short description and set the desired value. To associate the task with a parent record, define the Parent field. |
|                       | If adding the action to a subflow, you can **Allow flow designers to dynamically set field values** on page 1253. |
Delete Record action

Deletes a record on any table.

**Roles and availability**

- Available as a Flow Designer core action. Process analysts use the flow_designer role to add an action to a flow and define configuration details.

**Fields**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Record</td>
<td>The record to be deleted. Drag-and-drop a record data pill or use the data pill picker to select a record.</td>
</tr>
</tbody>
</table>

Get Catalog Variables action

Access Service Catalog variables as data pills in a flow.

**Roles and availability**

- Available as a Flow Designer core action. Process analysts use the flow_designer role to add an action to a flow and define configuration details.

**Fields**

<table>
<thead>
<tr>
<th>Fields</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requested Item [Requested Item]</td>
<td>The requested item from the Requested Items [sc_req_item] table.</td>
</tr>
<tr>
<td>Template Catalog Item [Catalog Item]</td>
<td>Select an item from the Catalog Items [sc_cat_item] table to populate the Catalog Variables slushbucket with the associated variables.</td>
</tr>
</tbody>
</table>
Log action
Logs a message in the Flow Designer log table.

Roles and availability

- Available as a Flow Designer core action. Process analysts use the flow_designer role to add an action to a flow and define configuration details.

Fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log level</td>
<td>Level of importance of the log message.</td>
</tr>
<tr>
<td></td>
<td>• Error</td>
</tr>
<tr>
<td></td>
<td>• Warn</td>
</tr>
<tr>
<td></td>
<td>• Info</td>
</tr>
<tr>
<td>Log message</td>
<td>Message to display in the log. Enter text or drag-and-drop data pills into the field.</td>
</tr>
</tbody>
</table>

Look Up Record action
Look up a record from any table based on defined conditions.

Roles and availability

- Available as a Flow Designer core action. Process analysts use the flow_designer role to add an action to a flow and define configuration details.

Fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table</td>
<td>Select a table from the list.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Conditions</td>
<td>Conditions to be met by the returned record.</td>
</tr>
<tr>
<td></td>
<td>When building a condition that looks up the value of a reference field, use a data pill that explicitly provides the Sys ID value. Ensure the condition has the format [reference field][is][Reference type data pill-&gt;Sys ID]. For example, both the Change and Incident tables contain a reference field to the User table. To look up change records where the requester is the caller from an incident record, create the condition [Requested by][is][Trigger-&gt;incident record-&gt;Caller-&gt;Sys ID].</td>
</tr>
<tr>
<td>If multiple records are found</td>
<td>Determines what is returned if more than one record matches the defined conditions.</td>
</tr>
<tr>
<td></td>
<td>• Return only the first record</td>
</tr>
<tr>
<td></td>
<td>• Fail the step</td>
</tr>
</tbody>
</table>
Look Up Records action

Look up multiple records on any table using defined conditions.
Roles and availability

- Available as a Flow Designer core action. Process analysts use the flow_designer role to add an action to a flow and define configuration details.

Fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table</td>
<td>Select a table from the list.</td>
</tr>
<tr>
<td>Conditions</td>
<td>Conditions to be met by the returned records.</td>
</tr>
<tr>
<td></td>
<td>When building a condition that looks up the value of a reference field, use a data pill that explicitly provides the Sys ID value. Ensure the condition has the format [reference field][is][Reference type data pill-&gt;Sys ID]. For example, both the Change and Incident tables contain a reference field to the User table. To look up change records where the requester is the caller from an incident record, create the condition [Requested by][is][Trigger-&gt;incident record-&gt;Caller-&gt;Sys ID].</td>
</tr>
<tr>
<td>Max Results</td>
<td>Maximum number of results returned.</td>
</tr>
</tbody>
</table>
Send Email action

Send an email to specified users or groups as an action in a flow.
Roles and availability

- Available as a Flow Designer core action. Process analysts use the flow_designer role to add an action to a flow and define configuration details.

Fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>To</td>
<td>The main recipients of the email. Enter a list of user email addresses separated by commas or white spaces. You can also drag-and-drop data pills that contain email addresses into the field, such as a User record. For example, if your action involves an incident record and you want to send an email to the group assigned to the incident, drag the [Assignment group] data pill from the data panel.</td>
</tr>
<tr>
<td>CC</td>
<td>Additional recipients copied on this email. Enter a list of user email addresses separated by commas or white spaces. You can also drag-and-drop data pills that contain email addresses into the field.</td>
</tr>
<tr>
<td>BCC</td>
<td>Additional recipients of this email, who are visible only to the sender (blind copied). Enter a list of user email addresses separated by commas or white spaces. You can also drag-and-drop data pills that contain email addresses into the field.</td>
</tr>
<tr>
<td>Subject</td>
<td>Subject of the email. You can enter text or drag-and-drop data pills into the field.</td>
</tr>
<tr>
<td>Body</td>
<td>The content of the message body. You can enter text or drag-and-drop data pills into the field.</td>
</tr>
</tbody>
</table>

**Note:** Flow Designer does not support the `${URI}` parameter for creating a link to a record in the email message body. Instead, consider inserting the information from the record in the email body using data pills, or create a notification step.

Testing the email action

To verify that the email was generated when testing the action, review the email record in the Email [sys_email] table. The Headers field indicates whether the email was successfully generated. For example:

```
X-ServiceNow-Source:FlowDesigner-9ad2747b0b710300f4eb8bf637673a1e
Message-ID:<193756824.0.1508534586438@[10.0.66.70]>
X-ServiceNow-Generated:true
```

Update Record action

Update an existing record in a table. You can dynamically add and configure fields for the record.
Roles and availability

- Available as a Flow Designer core action. Process analysts use the flow_designer role to add an action to a flow and define configuration details.

Fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Record</td>
<td>The record to be updated. Drag-and-drop a record data pill or use the data pill picker to select a record.</td>
</tr>
<tr>
<td>Table</td>
<td>Read-only. Set to the table associated with the record.</td>
</tr>
<tr>
<td>Field Values</td>
<td>Set the values of fields in the record to be updated. For example, to set the short description to a certain value, select Short description and set the desired value. If adding the action to a subflow, you can Allow flow designers to dynamically set field values on page 1253.</td>
</tr>
</tbody>
</table>

Wait For Condition action

Pause the flow until the record value conditions are met.

Roles and availability

- Available as a Flow Designer core action. Process analysts use the flow_designer role to add an action to a flow and define configuration details.

Fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Record</td>
<td>Drag-and-drop an input record or a record from a previous step.</td>
</tr>
<tr>
<td>Table</td>
<td>Read-only. Set to the table associated with the record.</td>
</tr>
<tr>
<td>Conditions</td>
<td>Select the record values necessary to resume running the flow. For example, if the condition is [State][is][Closed], the flow pauses until the condition is met. Once met, the flow moves on to the next step or action.</td>
</tr>
</tbody>
</table>
Flow Designer stages

Communicate the current stage of a request or flow with an end user.

When configuring stages in Flow Designer, you can:
London    ServiceNow    Now Platform  Capabilities

- Create any number of stages.
- Change stage labels and names.
- Set the estimated duration for a stage.
- Import a copy of a pre-defined stage set from the Stage Sets table. To learn more about stage sets, see Workflow stage sets on page 3281. Any changes made to the copy do not affect the original stage set record.

While stages can be added to a flow with a scheduled trigger, the stages are never displayed to an end user because there is no associated record for the stage field. Only use stages in flows with record and Service Catalog triggers. Stages are not supported on subflows.

View the stages of a flow in the flow execution details.

**Displaying stages in a stage field**

A stage field is a field of type Workflow that displays the stages of a flow to a user. For example, the Service Catalog uses a Stage field to indicate progress of a request as it is processed by an associated flow or workflow.

Stage fields display:
- Stages from flows with record or Service Catalog triggers.
- Stages from the associated flow. If the associated flow calls another flow, stages set on the child flow do not display.
- Stages from flows that have started.

State icons in stage fields cannot be modified. Limit the number of stages and the length of each stage name to represent each stage in a stage field without causing text and icons to wrap onto multiple lines.

**Note:** Only add one stage field per table. If there is more than one stage field, the system only displays stages from the first stage field defined in the table dictionary entry.
Stage field and trigger types

Associating a flow to a stage field depends on the flow trigger type.

<table>
<thead>
<tr>
<th>Flow trigger type</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Record</td>
<td>For a stage field to report stages on a record-based flow, a stage field must be present on the same table as the triggering record. When a flow has stages, Flow Designer communicates the status of each stage back to the triggering table and displays the current stage state as an icon. If more than one stage field exists on the table, only the first stage field defined in the table's dictionary definition is used.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Avoid creating stages for multiple flows that trigger from the same table. A stage field only displays the stages of the final flow to run. Add different conditions to each flow to ensure that the stages of one flow do not overwrite another flow.</td>
</tr>
<tr>
<td>Service Catalog</td>
<td>If using the Service Catalog trigger, the flow must be associated with the Service Catalog item through the Flow field. Remove any workflows associated with the item by clearing the Workflow and Execution Plan fields. The Stage field displays the current stage state on any list view of the Requested Items [sc_req_item] table.</td>
</tr>
</tbody>
</table>

Stage states

During flow execution, each stage can be in one of five states.

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pending</td>
<td>This stage has not yet started.</td>
</tr>
<tr>
<td>In progress</td>
<td>This stage is executing.</td>
</tr>
<tr>
<td>Skipped</td>
<td>This stage was skipped and did not run. Typically, this state is reached when a conditional flow logic block is not executed.</td>
</tr>
<tr>
<td>Complete</td>
<td>This stage is complete.</td>
</tr>
<tr>
<td>State</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
</tr>
<tr>
<td>Error</td>
<td>This stage has reached an error condition.</td>
</tr>
</tbody>
</table>

When designing a flow, you can manually set the flow to report an Error state. To set an Error state:

- The flow must have at least one stage defined.
- The Error can only be set within a stage. When an Error condition is reached, the current stage is set to Error.
- The Error can only be set within a conditional flow logic block.

While setting the Error state does not affect flow execution, it communicates to the user that the state of the current stage is Error. For example, if an approval is not approved within the required limit you may want to communicate an error to the user.

Each stage can have its own custom state labels. For example, suppose that you have a flow with two stages. Stage 1 could have the Pending state with the label Waiting, and Stage 2 could have a Pending state with a label of Not yet started. Flow Designer provides options to generate either the default states or approval states.

**Configure stages and add them to a flow**

Configure when stages display to a user, define stage state labels, and add stages to a flow within Flow Designer.

While stages can be added to a flow with a scheduled trigger, the stages are never displayed to an end user because there is no associated record for the stage field. Only use stages in flows with record and Service Catalog triggers.

Role required: flow_designer or admin

1. If not already present, create a stage field on the table that triggers the flow. A stage field is a field of type Workflow that displays the stages of a flow to a user. The Service Catalog Requested Items [sc_req_item] table has a stage field by default.

   For a stage field to report stages on a record-based flow, a stage field must be present on the same table as the triggering record.

   To add a field to a table, see Add and customize a field in a table.

2. If adding stages to a flow with a Service Catalog trigger, select the flow in the Flow field of the Service Catalog Item [sc_cat_item] table.

   If using the Service Catalog trigger, the flow must be associated with the Service Catalog item through the Flow field. Remove any workflows associated with the item by clearing the Workflow and Execution Plan fields. This enables a request for a catalog item to initiate a flow specific to that catalog item.

3. Open the flow in Flow Designer.

4. Create and configure stages in the More Actions menu. Alternatively, you can create stages within the flow itself.

   a) Click and select Stages.

      The Flow Stages / State menu opens.

   b) Click New Stage to add a new stage and configure the stage options.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Display name for the stage. Must be unique.</td>
</tr>
<tr>
<td>Value</td>
<td>Internal name for the stage. Must be unique.</td>
</tr>
<tr>
<td>Duration</td>
<td>Estimated duration displayed to the user.</td>
</tr>
<tr>
<td>Always Show</td>
<td>If selected, the stage always displays in the stage field, even if the stage is set within a flow logic block that might not execute.</td>
</tr>
</tbody>
</table>

c) Select a stage set to import from the Stage Sets table. To learn more about stage sets, see *Workflow stage sets* on page 3281. Any changes made to the copy do not affect the original stage set record.

5. Point to a location in the flow and click Add a Stage. Select a stage or click + to add a new stage inline.
   Stages can be applied at the beginning of any Flow Designer action or flow logic block, or within an If block. Stages are not supported within a For Each flow logic block.

TRIGGER

[Service Catalog]

ACTIONS

1. Get Catalog Variables from Apple iPhone 6s

6. Set a stage to the Error state within a conditional flow logic block.
   a) Point to a location and select Set "Error" State.
      To set a stage to the Error stage:
      • The flow must have at least one stage defined.
      • The Error can only be set within a stage. When an Error condition is reached, the current stage is set to Error.
      • The Error can only be set within a conditional flow logic block.
When the flow reaches the indicated point, the currently executing stage is set to Error in the stage field.

In a flow with a record-based trigger, Flow Designer communicates the status of each stage back to the triggering table and displays the current stage state as an icon. In a flow with a Service Catalog trigger, the Stage field displays the current stage state on any list view of the Requested Items [sc_req_item] table.

Subflows

Define a sequence of reusable actions that can be started from a flow, subflow, or script. Define inputs and outputs to pass data to and from the subflow.

All subflows consist of properties, one or more inputs, one or more outputs, a sequence of actions, and the data collected or created. Unlike flows, subflows:

- Do not have a trigger and are instead started from a parent flow, subflow, or script by a method call.
- Include inputs to specify data available to the subflow when it starts.
- Include outputs to specify data available to the parent flow after the subflow ends.

Using subflows, process analysts can:

- Create a set of reusable operations for use in multiple flows.
- Add flow logic in addition to actions.

Subflow properties

The subflow properties specify the subflow name, application, category, description, in-flow annotation, and status. Flow designers can update the subflow name, category, description, and in-flow annotation at any time, but can only set the application during subflow creation. The subflow status is set when you save or publish a subflow.
**Subflow inputs**

Subflow inputs specify the data available to the subflow when it starts. Each input you define for a subflow becomes a configuration option in the Flow Designer interface. To use the subflow in a flow, flow designers must define a value for each mandatory input. The more inputs a subflow has, the more data flow designers must define and the more familiar they must be with the underlying data model to use the subflow effectively.

Inputs provide advanced options based on their data type. All inputs have advanced options to add a hint or provide a default value. Use advanced options to guide flow designers through adding and configuring a subflow to a flow. For example, create a choice input to provide flow designers with a pre-defined list of configuration options to choose from. For more information about the configuration options available to particular data types, see *field types*.

**Subflow outputs**

Subflow outputs specify the data available to the parent flow after the subflow completes. Subflow outputs are defined as variables with a name and data type. Subflow designers assign values to an output using the Assign Subflow Output flow logic. Output values can be based on the subflow logic conditions, action results, or a manually set value. For example, an output may have one value when a condition is met and another value when a condition is not met. During runtime, the value of the output is determined by the condition that is met.

Consider the following example of a subflow with two conditions that both result in a value for a single output variable. The value of the variable depends on which condition is met during runtime.

<table>
<thead>
<tr>
<th>Outputs</th>
<th>[Manager ID] [String]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actions</td>
<td></td>
</tr>
<tr>
<td>• 1 Look Up [User] Record where (Created on Today)</td>
<td></td>
</tr>
<tr>
<td>• 2 If ([1-&gt;User Record-&gt;Title] contains Manager) then</td>
<td></td>
</tr>
<tr>
<td>• 2.1 Assign Subflow Outputs [Manager ID] to [1-&gt;User Record-&gt;User ID]</td>
<td></td>
</tr>
<tr>
<td>• 3 Else</td>
<td></td>
</tr>
<tr>
<td>• 3.1 Assign Subflow Outputs [Manager ID] to [1-&gt;User Record-&gt;Manager-&gt;User ID]</td>
<td></td>
</tr>
</tbody>
</table>

In this case, if the user’s title contains "Manager" then the user ID is assigned as output. Otherwise, the subflow looks up the user’s manager and assigns the user ID of the manager as output.

Flow Designer allows you to define a value for the same variable multiple times. However, if a variable is given two or more possible values without conditional logic, only the last value defined in the subflow is applied to the output at runtime.

<table>
<thead>
<tr>
<th>Outputs</th>
<th>[Manager ID] [String]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actions</td>
<td></td>
</tr>
<tr>
<td>• 1 Look Up [User] Record where (Created on Today)</td>
<td></td>
</tr>
<tr>
<td>• 2 Assign Subflow Outputs [Manager ID] to [1-&gt;User Record-&gt;User ID]</td>
<td></td>
</tr>
</tbody>
</table>
In this example, action three overwrites the value of action two and [1->User Record->Manager->User ID] is applied to the [Manager ID] output at runtime because it was the last value defined. Typically, subflows should only include multiple values for one variable if conditional flow logic is used.

**Actions**

Within Actions, flow designers can add actions, flow logic, flows, or other subflows.

An action is a reusable operation that enables process analysts to automate Now Platform features without having to write code. For example, the Create Record action allows process analysts to generate records in a particular table with particular values when certain conditions occur. Core actions like Create Record require some familiarity with Now Platform tables and fields. Action designers can create application-specific actions to pre-set configuration details. For example, creating a Create Incident Task action ensures that the process analyst uses the correct table and field configuration each time the action is used. You can add application-specific actions by activating the associated spoke.

**Flow logic**

Subflows can contain flow logic to specify conditional or repeated actions, or to assign output variables to subflow data. The system provides these flow logic options.

### Table 451: Available flow logic

<table>
<thead>
<tr>
<th>Flow logic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>For Each</td>
<td>Applies actions to each record in a list of records. Flow designers must specify the list of records from the subflow data. <strong>Note:</strong> Add a For Each flow logic block inside of another to repeat an action over a series of records. However, avoid nested For Each loops that process many records. Nested loops may cause the flow to run until stopped by the flow transaction quota rule, which prevents flows from running longer than an hour. For more information about transaction quotas, see Transaction quotas.</td>
</tr>
<tr>
<td>If</td>
<td>Applies actions when a list of conditions is met. Flow designers can specify the conditions with subflow data. Once an If condition is added, you can add an Else or Else If flow logic option to define behavior when conditions are not met.</td>
</tr>
<tr>
<td>Assign Subflow Outputs</td>
<td>Assigns an output variable to subflow data. Only outputs defined in Inputs &amp; Outputs can be assigned a value. Assigning outputs enables you to assign a different output variable for each logical path in the subflow.</td>
</tr>
</tbody>
</table>

**Testing subflows**

You can test a subflow alone, or when added to a flow. When testing a subflow alone, you must define the inputs that the subflow uses in its actions. Because a subflow does not have a trigger, testing a subflow runs the actions using the defined input values.
Note: Flow designers should always test flows and subflows on sub-production instances containing relevant demonstration data since testing a subflow creates or changes records on the instance.

Roles

To access subflows, a user must have the flow_designer or admin role.

Create a subflow

Create a reusable sequence of actions that can be added to multiple flows.

- Role required: flow_designer or admin
- Create a custom application to store Flow Designer content.

Flow designers should know the application table structure and be aware of any existing business logic associated with the target tables of a flow or subflow. Be sure to disable any conflicting business rules or workflows before creating a flow or subflow.

Creating a custom application to contain your Flow Designer content allows you to deploy it using the application repository or the ServiceNow Store.

1. Navigate to Flow Designer Designer.
2. Click + New New Subflow.
   The Subflow properties dialog displays.
3. Fill in the following properties:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the subflow.</td>
</tr>
<tr>
<td>Application</td>
<td>Application scope to create the subflow in.</td>
</tr>
<tr>
<td>Category</td>
<td>Logical group for subflow.</td>
</tr>
<tr>
<td>Protection</td>
<td>Select whether the subflow is read-only. You can only select a value when</td>
</tr>
<tr>
<td></td>
<td>you create the subflow in an application scope you own. The default value</td>
</tr>
<tr>
<td></td>
<td>is None.</td>
</tr>
<tr>
<td>In-Flow Annotation</td>
<td>Help text that appears under the subflow title in Flow Designer to help</td>
</tr>
<tr>
<td></td>
<td>flow designers understand what the subflow does when used in a flow.</td>
</tr>
<tr>
<td>Description</td>
<td>Description of the subflow.</td>
</tr>
</tbody>
</table>

4. Create subflow inputs to specify the data available to the subflow when it starts.
   Each input you define for a subflow becomes a configuration option in the Flow Designer interface.
   To use the subflow in a flow, flow designers must define a value for each mandatory input. The more inputs a subflow has, the more data flow designers must define and the more familiar they must be with the underlying data model to use the subflow effectively.
   a) Click + to open the Inputs & Outputs pane.
   b) Click + to add a new input.
   c) Define the name and type for the input.
   d) To make the input a mandatory configuration option, select the Mandatory flag.
e) Click to view the advanced options and define values. Inputs provide advanced options based on their data type. All inputs have advanced options to add a hint or provide a default value. Use advanced options to guide flow designers through adding and configuring a subflow to a flow. For example, create a choice input to provide flow designers with a pre-defined list of configuration options to choose from. For more information about the configuration options available to particular data types, see field types.

5. Create subflow outputs by defining the names and data types.
Subflow outputs specify the data available to the parent flow after the subflow completes.
   a) Click + to add a new output.
   b) Define the name and the data type.
      Output values are assigned in later steps.

| Inputs | | |
| Name | Type | Mandatory |
| Incident | Reference.Incident | |

| Outputs | | |
| Name | Type |
| Caller name | String |
| Incident short description | String |

6. Add actions, flows, subflows, or flow logic.
   a) Under Actions, click + and select an option.
Option | Description
--- | ---
Action | Select the desired action. Flow Designer includes a set of *Actions* on page 1255 available to flows and subflows. Alternatively, an action designer can create additional actions to add to flows. The *IntegrationHub* on page 1327 and *spoke* plugins install additional actions.

To add draft actions, set Show draft actions to true from the More Actions menu.

Flow Logic | Select an option to specify conditional or repeated operations.

Subflow | Select a published subflow and define input values. In addition to adding a subflow as a flow action, you can enable the Show triggered flows option from the More Actions menu to select an activated flow and define the required inputs. Running a triggered flow ignores its trigger conditions and runs all actions.

To change the order of an action in a flow, drag-and-drop the handle on the left side of the action. The system displays a set of fields depending on the option selected.

b) Fill in the fields to configure the action, flow, or subflow.

c) Click Done.

d) Repeat adding actions until complete.

7. **Assign subflow outputs to a value.**

You can assign a subflow output to multiple values, enabling you to create conditional outputs based on flow logic.

a) Under Actions, click + and select Flow Logic.

b) Click Assign Subflow Outputs.

c) In the Name field, select an output you created in the Inputs & Outputs section. You can only assign values to outputs that have already been given a name and data type.

d) In the Data field, enter a value or select a data pill from the data panel.

e) Click Done.
Test the subflow, and publish it when it is ready to be added to a flow or called from a script.

**Test a subflow**

You can test a subflow alone, or when added to a flow. When testing a subflow alone, you must define the inputs that the subflow uses in its actions. Because a subflow does not have a trigger, testing a subflow runs the actions using the defined input values. Unless updated, subsequent tests use the same inputs defined in the initial test run.

Role required: flow_designer or admin

*Create a subflow* on page 1279 and save it. Flow Designer only tests saved subflows.

Flow designers should always test flows and subflows on sub-production instances containing relevant demonstration data since testing a subflow creates or changes records on the instance.

1. Navigate to Flow Designer Designer.
2. Click the subflows tab and open a saved subflow.
3. Click Test. The Test Subflow dialog opens.
4. Define input values for the subflow to use in its actions. The values defined are remembered on future test runs.
5. Click Run Test.
6. After the flow executes, click Subflow has been executed. To view the subflow, click here. The Execution Details open.

Once the subflow behaves as desired, you can *publish the subflow* and add it to a flow.

**Publish a subflow**

Publish a subflow to make it available to other users and to add it to activated flows.

Role required: flow_designer or admin

*Create a subflow* on page 1279, *test the subflow*, and verify that it is working as expected.

1. Navigate to Flow Designer Designer.
2. Click the subflows tab and open a tested subflow.
3. Click Publish.

The subflow can be added to activated flows. If you update the subflow after it is published, you must click Publish again to see the changes when the parent flow is run. After publishing changes, all parent flows that use the subflow are automatically updated to use the current version.

**Action Designer**

Automate a task with a sequence of related steps such as lookup a record, create a record, and log details about the record creation. Actions separate complexity from the Flow Designer environment, enabling flow designers to add actions to multiple flows with minimal configuration.

Using Action Designer, subject matter experts can:
- Create application-specific actions with pre-set configuration details, enabling process analysts to easily add actions to a flow with little configuration.
- Create scripted actions that appear code-less when added to a flow.
- Build integrations using IntegrationHub.

**Custom actions**

Unlike core actions where flow designers must manually configure flow logic, custom actions always use the same configuration when added to a flow. If your flow designers often use an action with the same configuration, you might create a reusable action.

A reusable action includes these components.

**Inputs**

Inputs are data variables used in your action. For example, if an action step creates a record in the incident table, your input might be a reference to the incident table. Once added as an input, the table and its fields are available to steps and outputs in the flow.

Each input you define for an action becomes a configuration option in the Flow Designer interface. To use the action in a flow, flow designers must define a value for each mandatory input. The more inputs an action has, the more data flow designers must define and the more familiar they must be with the underlying data model to use the action effectively.

Inputs provide advanced options based on their data type. All inputs have advanced options to add a hint or provide a default value. Use advanced options to guide flow designers through adding and configuring an action to a flow. For example, create a choice input to provide flow designers with a pre-defined list of configuration options to choose from. For more information about the configuration options available to particular data types, see field types.

**Action steps**

An action step or step is a single reusable operation within an action. For example, the Create Record
step allows action designers to specify the table and field values to use during record creation. Action steps require subject matter expertise with application tables, fields, and business logic. Application developers or IT generalists add action steps to actions from the Action Designer design environment. Flow Designer provides a set of core action steps to automate Now Platform processes. You can add application-specific action steps by activating the associated spoke.

**Outputs**

*Outputs* are data variables that represent the results of the action. These results are available to other actions in a flow.

### Action Designer environment

Subject matter experts build custom actions in Action Designer.

Create and edit actions by defining inputs and adding action steps. Copy actions to use existing actions as templates. Publish actions to activate them, which makes them available to activated flows and to preserve their current action steps, variables, and sequence as a snapshot separate from further configuration changes.

### Roles

To create custom actions, a user must have the action_designer or admin roles.

### Action input and output data types

You can define input variables for your Flow Designer actions. Input variables and data used in action steps can be defined as output variables.

Action inputs are data variables with a name and data type. You must associate some data types with a reference table, which makes the record and fields available to the action steps. Available data types include:

- Audio
- Choice
• Color
• Condition String
• Conditions – Reference table required
• Currency
• Data Structure
• Date
• Date/Time
• Document ID – Reference table required
• Due Date
• Duration
• Encrypted Text
• Field Name
• Floating Point Number
• HTML
• IP Address (Validated IPV4, IPV6)
• Icon
• Image
• Integer
• Journal
• Journal Input
• Journal List
• List
• Long
• Name-Value Pairs
• Password (1 Way Encrypted)
• Password (2 Way Encrypted)
• Percent Complete
• Phone Number (E164)
• Price
• Records – Reference table required
• Reference – Reference table required
• Script
• Script (Plain)
• String
• String (Full UTF-8)
• Table Name
• Template Value – Reference table required
• Time
• Translated HTML
• Translated Text
• True/False
• URL
• Video
• Wiki
• Workflow

Create an action
Create a reusable component to automate one or more steps of a process.
• Create a custom application to store Flow Designer content.
• Role required: action_designer or admin

Action designers should know the application table structure and be aware of any existing business logic associated with the target tables of an action. Be sure to disable any conflicting business rules or workflows before creating an action.

Creating a custom application to contain your Flow Designer content enables you to deploy it using the application repository or the ServiceNow Store.

1. Navigate to Flow Designer Designer.
2. Click the Actions tab and select New Action.
3. Fill in the Action Properties and click Submit.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of action.</td>
</tr>
<tr>
<td>Accessible From</td>
<td>Accessible from all application scoped or only within the specified application scope.</td>
</tr>
<tr>
<td>Category</td>
<td>Defined category within the application scope for an action.</td>
</tr>
<tr>
<td>Protection</td>
<td>Select whether the action is read-only. You can only select a value when you create the action in an application scope you own. The default value is None.</td>
</tr>
<tr>
<td>Description</td>
<td>Description of the action.</td>
</tr>
<tr>
<td>Application</td>
<td>Application scope of the action.</td>
</tr>
<tr>
<td>In-Flow Annotation</td>
<td>Help text that appears under the action title in Flow Designer to help flow designers understand what the action does when used in a flow.</td>
</tr>
</tbody>
</table>

An empty action opens.

4. Define action inputs to make data available to the action steps and outputs.
   a) Select + Create Input and complete the fields.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the input. This value is used as the name of the data pill in the right-hand pane.</td>
</tr>
<tr>
<td>Type</td>
<td>Data type of the input. For supported data types, see Action input and output data types on page 1284.</td>
</tr>
<tr>
<td>Reference Table</td>
<td>Reference table for the data type. Only required for the following data types:</td>
</tr>
<tr>
<td></td>
<td>• Conditions</td>
</tr>
<tr>
<td></td>
<td>• Document ID</td>
</tr>
<tr>
<td></td>
<td>• Records</td>
</tr>
<tr>
<td></td>
<td>• Reference</td>
</tr>
<tr>
<td></td>
<td>• Template Value</td>
</tr>
</tbody>
</table>
Inputs are represented as data pills in the right-hand pane. You can add inputs to steps and outputs in the flow by dragging and dropping data pills.

5. Add an action step to perform an operation on the action inputs.
   a) Click the + underneath Inputs in the Action Outline.
   b) Select the step you would like to perform.
   c) Complete the fields in the step.

6. Add action outputs to make data available to a flow.
   a) Select + Create Outputs and complete the fields.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the output. This value is the name of the data pill in the right-hand pane when the action is added to a flow.</td>
</tr>
<tr>
<td>Value</td>
<td>Data used previously in the action either in a step or input. Adding a variable to the output makes the value available to the flow.</td>
</tr>
</tbody>
</table>

7. Click Save.
   Action Designer saves a draft of the action.

Test the action by adding it to a flow that has Show draft actions set to true. To add the action to a published flow, or a flow that has Show draft actions set to false, you must first click Publish.

**Note:** By default, the system only runs published actions.

### Ask for Approval step

Request approval for a record with an approval field. You can configure a rule set for an approval, rejection, or cancellation. If a due date is added to an approval, the approval is automatically approved, rejected, or canceled if the approvers have not responded by the designated time.

*Approvals* on page 2404 is a platform feature that enables users or groups to approve or reject a task.
Roles and availability

- Available as an Action Designer action step. Subject matter experts use the action_designer role to create a custom action with one or more action steps.

Fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Record</td>
<td>Select a record under the data panell and drag the record pill into the Record field. If selecting a table with an approval field already configured, the Approval field is set to the correct field.</td>
</tr>
<tr>
<td>Table</td>
<td>Set to the table name associated with the record.</td>
</tr>
<tr>
<td>Approval field</td>
<td>Select a field from the designated table to use for approval.</td>
</tr>
<tr>
<td>Journal field</td>
<td>Select a field from the designated table to use for journal.</td>
</tr>
<tr>
<td>Rules</td>
<td>Define the approval and rejection rules. Approval rules determine which users can approve or reject requests, and what happens after approval or rejection. Approval or rejection rules include:</td>
</tr>
<tr>
<td></td>
<td>• Anyone approves</td>
</tr>
<tr>
<td></td>
<td>• All users approve</td>
</tr>
<tr>
<td></td>
<td>• All responded and anyone approves</td>
</tr>
<tr>
<td></td>
<td>• % of users approve</td>
</tr>
<tr>
<td></td>
<td>• # of users approve</td>
</tr>
</tbody>
</table>

In the field beside the approval rule, add the desired approvers. To add approvers:

- Select individual users or groups.
- Drag-and-drop or select a field from a record.

Select to allow a manual approver to process an approval or rejection. A manual approver is a user manually added to the Approvers related list who can then approve the request. For example, you can manually add a subject matter expert to a task to approve the request. To learn more about adding manual approvers, see Generate approvals using the approvers related list on page 2422.

Define rejection rules by adding another OR rule set. When defining approvals, include rejection rules that run when there are no matching approvals. Such rejection rules prevent the flow from remaining in a waiting state. For example, if an approval can be approved by anyone, create a time-based rejection rule in case no one approves it.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Due Date</td>
<td>Define a due date to ensure that the flow does not remain in a waiting state if the request is not approved or denied.</td>
</tr>
<tr>
<td></td>
<td>- None: The approval is not dependent on a specific date.</td>
</tr>
<tr>
<td></td>
<td>- Approve: Automatically approve the step if an action is still pending by the specified date.</td>
</tr>
<tr>
<td></td>
<td>- Reject: Automatically reject the step if an action is still pending by the specified date.</td>
</tr>
<tr>
<td></td>
<td>- Cancel: Automatically cancel the step if an action is still pending by the specified date.</td>
</tr>
</tbody>
</table>

**Example**

### Create Record step

Creates a record on any table. You can dynamically add and configure fields for the record.
Roles and availability

• Available as an Action Designer action step. Subject matter experts use the action_designer role to create a custom action with one or more action steps.

Fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table</td>
<td>Select a table from the list.</td>
</tr>
<tr>
<td>Field Values</td>
<td>Set static or dynamic values of fields in the record. For example, to set the short description to a static value, select Short description and set the desired value. To add dynamic values, see Allow flow designers to dynamically set field values on page 1253.</td>
</tr>
</tbody>
</table>

Create Task step

Create a task on any ServiceNow task table. After you choose the task table, you can dynamically select the fields to configure the action. Defining the Parent field associates the task to a parent record.

Roles and availability

• Available as an Action Designer action step. Subject matter experts use the action_designer role to create a custom action with one or more action steps.
## Fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table</td>
<td>Select a task table.</td>
</tr>
<tr>
<td></td>
<td>• Catalog Task [sc_task]</td>
</tr>
<tr>
<td></td>
<td>• Change Phase [change_phase]</td>
</tr>
<tr>
<td></td>
<td>• Change Request [change_request]</td>
</tr>
<tr>
<td></td>
<td>• Chat Queue Entry [chat_queue_entry]</td>
</tr>
<tr>
<td></td>
<td>• Feature Task [release_task]</td>
</tr>
<tr>
<td></td>
<td>• Follow On Task [cert_follow_on_task]</td>
</tr>
<tr>
<td></td>
<td>• Group approval [sysapproval_group]</td>
</tr>
<tr>
<td></td>
<td>• Guided Setup Task [gsw_task]</td>
</tr>
<tr>
<td></td>
<td>• IMAC [change_request_imac]</td>
</tr>
<tr>
<td></td>
<td>• Incident [incident]</td>
</tr>
<tr>
<td></td>
<td>• Incident Task [incident_task]</td>
</tr>
<tr>
<td></td>
<td>• KB Submission [kb_submission]</td>
</tr>
<tr>
<td></td>
<td>• Orphan CI Remediation [orphan_ci_remeditation]</td>
</tr>
<tr>
<td></td>
<td>• Private Task [vtb_task]</td>
</tr>
<tr>
<td></td>
<td>• Problem [problem]</td>
</tr>
<tr>
<td></td>
<td>• Problem Task [problem_task]</td>
</tr>
<tr>
<td></td>
<td>• Reclassification Task [reclassification_task]</td>
</tr>
<tr>
<td></td>
<td>• Recommended Field Remediation [recommended_field_remediation]</td>
</tr>
<tr>
<td></td>
<td>• RemEDIATE Duplicate Task [reconcile_duplicate_task]</td>
</tr>
<tr>
<td></td>
<td>• Release Phase [release_phase]</td>
</tr>
<tr>
<td></td>
<td>• Renew Lease Task [statemgmt_renew_lease_task]</td>
</tr>
<tr>
<td></td>
<td>• Request [sc_request]</td>
</tr>
<tr>
<td></td>
<td>• Request new Knowledge Base</td>
</tr>
<tr>
<td></td>
<td>• [kb_knowledge_base_request]</td>
</tr>
<tr>
<td></td>
<td>• Requested Item [sc_req_item]</td>
</tr>
<tr>
<td></td>
<td>• Required Field Remediation [required_field_remediation]</td>
</tr>
<tr>
<td></td>
<td>• Security Case [sn_ti_case]</td>
</tr>
<tr>
<td></td>
<td>• Security Incident [sn_si_incident]</td>
</tr>
<tr>
<td></td>
<td>• Security Incident Response Task [sn_si_task]</td>
</tr>
<tr>
<td></td>
<td>• Security Request [sn_si_scan_request]</td>
</tr>
<tr>
<td></td>
<td>• Service Order [sm_order]</td>
</tr>
<tr>
<td></td>
<td>• Service Order Task [sm_task]</td>
</tr>
<tr>
<td></td>
<td>• Service Task [service_task]</td>
</tr>
<tr>
<td></td>
<td>• Stale CI Remediation [stale_ci_remediation]</td>
</tr>
<tr>
<td></td>
<td>• Standard Change Proposal [std_change_proposal]</td>
</tr>
<tr>
<td></td>
<td>• Ticket [ticket]</td>
</tr>
</tbody>
</table>

### Field Values

Set static or dynamic values of fields in the record. For example, to set the short description to a static value, select Short description and set the desired value.

To add dynamic values, see [Allow flow designers to dynamically set field values](#) on page 1253.

To associate the task with a parent record, define the Parent field.
### London 

### ServiceNow 

### Now Platform Capabilities

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wait</td>
<td>Waits to complete the step until the task completes and is no longer active (active=false). Alternatively, you can add a wait condition by dragging-and-dropping a true/false field from the data panel into the Wait field. The flow only waits for the task to complete when the condition field is true.</td>
</tr>
</tbody>
</table>

**Delete Record step**

Deletes a record on any table.

**Roles and availability**

- Available as an Action Designer action step. Subject matter experts use the action_designer role to create a custom action with one or more action steps.

**Fields**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Record</td>
<td>The record to be deleted. Drag-and-drop a record data pill or use the data pill picker to select a record.</td>
</tr>
<tr>
<td>Table</td>
<td>Read-only. Set to the table associated with the record.</td>
</tr>
</tbody>
</table>

**Log step**

Logs a message in the Flow Designer log table.

**Roles and availability**

- Available as an Action Designer action step. Subject matter experts use the action_designer role to create a custom action with one or more action steps.

**Fields**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log level</td>
<td>Level of importance of the log message.</td>
</tr>
<tr>
<td></td>
<td>• Error</td>
</tr>
<tr>
<td></td>
<td>• Warn</td>
</tr>
<tr>
<td></td>
<td>• Info</td>
</tr>
</tbody>
</table>
### Look Up Record step

Look up a record from any table based on defined conditions.

### Roles and availability

- Available as an Action Designer action step. Subject matter experts use the action_designer role to create a custom action with one or more action steps.

### Fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log message</td>
<td>Message to display in the log. Enter text or drag-and-drop data pills into the field.</td>
</tr>
<tr>
<td>Table</td>
<td>Select a table from the list.</td>
</tr>
<tr>
<td>Conditions</td>
<td>Set static or dynamic conditions to filter records. To define a static condition applied each time the action runs, define the conditions with the condition builder. To enable flow designers to dynamically apply conditions, define an input of type Conditions and drag-and-drop the input data pill into the Conditions field. When building a condition that looks up the value of a reference field, use a data pill that explicitly provides the Sys ID value. Ensure the condition has the format [reference field][is][Reference type data pill-&gt;Sys ID]. For example, both the Change and Incident tables contain a reference field to the User table. To look up change records where the requester is the caller from an incident record, create the condition [Requested by][is][action-&gt;incident-&gt;Caller-&gt;Sys ID] where incident is an input variable for an incident record.</td>
</tr>
<tr>
<td>If multiple records are found</td>
<td>Determines what is returned if more than one record matches the defined conditions.</td>
</tr>
<tr>
<td></td>
<td>• Return only the first record</td>
</tr>
<tr>
<td></td>
<td>• Fail the step</td>
</tr>
</tbody>
</table>
Example

1. Look Up Record step

![Table selection and condition setup]

Look Up Records step

Look up multiple records on any table using defined conditions.

Roles and availability

- Available as an Action Designer action step. Subject matter experts use the action_designer role to create a custom action with one or more action steps.

Fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table</td>
<td>Select a table from the list.</td>
</tr>
</tbody>
</table>
### Conditions

Set static or dynamic conditions to filter records. To define a static condition applied each time the action runs, define the conditions with the condition builder. To enable flow designers to dynamically apply conditions, define an input of type Conditions and drag-and-drop the input data pill into the Conditions field.

When building a condition that looks up the value of a reference field, use a data pill that explicitly provides the Sys ID value. Ensure the condition has the format `[reference field][is][Reference type data pill->Sys ID]`. For example, both the Change and Incident tables contain a reference field to the User table. To look up change records where the requester is the caller from an incident record, create the condition `[Requested by][is][action->incident->Caller->Sys ID]` where incident is an input variable for an incident record.

### Max Results

Maximum number of results returned.

---

**Example**

### 1. Look Up Records step

<table>
<thead>
<tr>
<th>Table</th>
<th>Incident [incident]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conditions</td>
<td>All of these conditions must be met</td>
</tr>
<tr>
<td>Assigned to</td>
<td>is Bow Ruggeri</td>
</tr>
<tr>
<td>State</td>
<td>is New</td>
</tr>
<tr>
<td>Max Results</td>
<td>1000</td>
</tr>
</tbody>
</table>

**Notification step**

Trigger a notification as a step within an action by selecting a record (such as an incident, change request, problem, or user record) to trigger a notification and defining the associated notification.

*Notifications* on page 596 is a platform feature. Before triggering a notification as an action step in Flow Designer, ensure that the notification is set up for use in the platform.

- When you *create or update the notification*, set the Send when field in the When to send tab of the Notification form to Triggered.
- Verify that your users have an active primary email channel and that all their notifications are active.
Roles and availability

- Available as an Action Designer action step. Subject matter experts use the action_designer role to create a custom action with one or more action steps.

Fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Record</td>
<td>Drag-and-drop an input record or a record from a previous step. This is the record that will trigger a notification. Some notifications are not associated with a specific record or table, such as the Passwords Require Updating notification. If configuring such a notification, leave this field blank.</td>
</tr>
<tr>
<td>Table name</td>
<td>Read-only. Set to the table of the triggering record.</td>
</tr>
<tr>
<td>Notification</td>
<td>Select the notification to be triggered. The notifications that can be selected are associated with the table of the specified record. If no record was selected, you can select a notification that does not have an associated record or table. To create notifications, see Create an email notification.</td>
</tr>
</tbody>
</table>

Example

1. Notification step

PowerShell step

Run PowerShell scripts on remote machines from your ServiceNow instance through a MID Server.

PowerShell is built on the Windows .NET Framework and is designed to control and automate the administration of Windows machines and applications. ServiceNow supports PowerShell 2.0 and above. PowerShell 3.0 does not support Windows 2003 Server.

Note: PowerShell step is not available on the base system and requires a separate IntegrationHub subscription. After the IntegrationHub plugin is activated, the step is visible under Integrations.
### Roles and availability

- Available as an Action Designer action step. Subject matter experts use the action_designer role to create a custom action with one or more action steps.

### Fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection</td>
<td>Type of connection to use.</td>
</tr>
<tr>
<td></td>
<td>- Define Connection Inline: Define connection information within the action step.</td>
</tr>
<tr>
<td></td>
<td>- Use Connection Alias: Define connection information using the Connection Alias table. Using an alias eliminates the need to configure multiple credentials and connection information profiles when using an action in multiple environments. Likewise, if the connection information changes, you do not have to update your custom action.</td>
</tr>
<tr>
<td></td>
<td>To learn more about connections and credentials, see credentials, connections, and aliases.</td>
</tr>
<tr>
<td>Connection Alias</td>
<td>Specify the Connection &amp; Credential alias record the system uses to run the action step. Requires a flow designer or admin to create or select an associated Connection record. Using an alias eliminates the need to configure multiple credentials and connection information profiles when using an action in multiple environments. Likewise, if the connection information changes, you do not have to update your custom action. To learn more about connections and credentials, see credentials, connections, and aliases.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This field is only visible when the Connection is Use Connection Alias.</td>
</tr>
<tr>
<td>Credential Alias</td>
<td>Specify the credential alias the system uses to run the action step. Requires a flow designer or admin to create or select an associated Credential record. Using an alias eliminates the need to configure multiple credentials when using an action in multiple environments. Likewise, if the credential information changes, you do not have to update your custom action. To learn more about connections and credentials, see credentials, connections, and aliases.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This field is only visible when the Connection is Define Connection Inline.</td>
</tr>
<tr>
<td>Host</td>
<td>Specify the fully-qualified domain name of the target host where the system runs the action step. For example, host.domain.com.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This field is only visible when the Connection is Define Connection Inline.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Port</td>
<td>Specify the communications port on which the target host listens for connections. For example, 5985. Leave blank to use the default port. <strong>Note:</strong> This field is only visible when the Connection is Define Connection Inline.</td>
</tr>
<tr>
<td>MID Application</td>
<td>Specify the application the MID Server must support to be eligible for selection. The system runs the action step from a MID Server that supports the selected application. <strong>Note:</strong> This field is only visible when the Connection is Define Connection Inline.</td>
</tr>
<tr>
<td>Capabilities</td>
<td>Specify the capabilities the MID Server must support to be eligible for selection. The system runs the action step from a MID Server that supports the selected capabilities. <strong>Note:</strong> This field is only visible when the Connection is Define Connection Inline.</td>
</tr>
<tr>
<td>Remoting Type</td>
<td>The location where the PowerShell script runs such as the MID or a remote server.</td>
</tr>
<tr>
<td></td>
<td>• Explicit Remoting (Most Common): Establish a connection with and run the script on a remote server.</td>
</tr>
<tr>
<td></td>
<td>• Implicit Remoting (Advanced): Run a script on a MID Server while importing necessary modules from a remote server. If selected, define the Remote name prefix and Modules to import fields. For optimal performance, only import modules necessary to the step. If blank, all available modules are imported from the server.</td>
</tr>
<tr>
<td></td>
<td>• Run on a MID Server or have your script establish a remote session: Run a script directly on a MID Server, or define remoting specifications within the script. This value is the default. <strong>Note:</strong> To invoke a function in a PowerShell script command or PowerShell script file, the command must define the function param block if the function has input parameters. This requirement applies to explicit and implicit remoting. For additional information on param block, see Microsoft's documentation on Windows Powershell parameters at <a href="https://technet.microsoft.com/">https://technet.microsoft.com/</a>.</td>
</tr>
<tr>
<td>Remote name prefix</td>
<td>The file path, excluding file names, to the modules to load from the remote server. <strong>Note:</strong> This field is only visible when the Remoting Type is Implicit Remoting (Advanced).</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Modules to import</td>
<td>The comma-separated list of modules to import from the remote server at the defined file path.</td>
</tr>
<tr>
<td><strong>Note:</strong></td>
<td>This field is only visible when the Remoting Type is Explicit Remoting (Most Common) or Implicit Remoting (Advanced).</td>
</tr>
<tr>
<td>Script type</td>
<td>The type of script to run on the PowerShell host.</td>
</tr>
<tr>
<td>• Inline script</td>
<td>Enter the script to run in the Command field of the step.</td>
</tr>
<tr>
<td>• MID Server Script File</td>
<td>Select the PowerShell script to run from the MID Server Script Files [ecc_agent_script_file] table. This is the default value and separates scripting logic from the action, enabling you to update the script without having to modify and redeploy the action.</td>
</tr>
<tr>
<td>MID Server Script</td>
<td>Pre-defined PowerShell script from the MID Server Script Files table [ecc_agent_script_file].</td>
</tr>
<tr>
<td><strong>Note:</strong></td>
<td>This field is only available if the Script type is MID Server Script File.</td>
</tr>
<tr>
<td>Script path</td>
<td>Read-only path to the selected MID Server script.</td>
</tr>
<tr>
<td><strong>Note:</strong></td>
<td>This field is only visible when the Script type is MID Server Script File.</td>
</tr>
<tr>
<td>Input variables</td>
<td>The optional name-value pairs that represent the values of PowerShell script variables. You can use action inputs and data from other steps within the PowerShell script. Define the following fields for each variable:</td>
</tr>
<tr>
<td>• Name: The name of the script variable to pass a value to. The name cannot match a reserved or prohibited PowerShell variable. Some variable names are reserved for internal processing and should not be used as input variables. See Reserved variables in PowerShell scripting variables.</td>
<td></td>
</tr>
<tr>
<td>• Type: The type of PowerShell variable. Select plain text, encrypted, or boolean. If encrypted is selected, the value appears in plain text in this field and is only encrypted when it passes to the ECC Queue.</td>
<td></td>
</tr>
<tr>
<td>• Value: The value to map to the variable. Manually enter a value, or drag a data pill into the field.</td>
<td></td>
</tr>
<tr>
<td>Command</td>
<td>The inline PowerShell script to run on the target host.</td>
</tr>
<tr>
<td><strong>Note:</strong></td>
<td>This field is only visible when the Script type is Inline script.</td>
</tr>
</tbody>
</table>
PowerShell scripting variables

To access input variables from the Command field, you must call them using special syntax. The syntax you use depends on the value of a system property. If the Remoting Type is Run on a MID Server or have your script establish a remote session, some reserved variables are available in addition to input variables.

Input variable syntax

By default, prefix variable names with a $ character. For example, if an input variable is named message, use $message to access the variable in script.

If the mid.powershell.command.script.parameter_passing parameter is set to false, prefix the variable name with $env:SNC_. For example, if an input variable is named message, use $env:SNC_message to access the variable in script. To learn more about the mid.powershell.command.script.parameter_passing parameter, see MID Server parameters on page 1648.

Reserved variables

When the Remoting Type is Run on a MID Server or have your script establish a remote session, the following variables are available for use in script. Reserved variables cannot be used as custom input variable names.

<table>
<thead>
<tr>
<th>Reserved variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$computer</td>
<td>Host IP address defined in the Connection alias record.</td>
</tr>
<tr>
<td>$cred</td>
<td>Credential object that contains the credentials defined in the connection record. Use this variable with any PowerShell cmdlet that supports the credential parameter. For example, New-PSSession -credential $cred.</td>
</tr>
<tr>
<td>$log_info</td>
<td>If the mid.property.powershell.log_info property is set to true, adds logging information to a PowerShell script.</td>
</tr>
</tbody>
</table>

The following variable names are reserved for internal processing and should not be used as input variables.

- script
- useCred
- isMid
- isDiscovery
REST step

Send an outbound REST web service request to an external system.

**Note:** REST step is not available on the base system and requires a separate IntegrationHub subscription. After the IntegrationHub plugin is activated, the step is visible under Integrations.

*Outbound REST web service* is a platform feature that allows you to retrieve, create, update, or delete data on a web services server that supports the REST architecture.

**Roles and availability**

- Available as an Action Designer action step. Subject matter experts use the action_designer role to create a custom action with one or more action steps.

**Fields**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection</td>
<td>The type of connection to use.</td>
</tr>
<tr>
<td></td>
<td>• Define Connection Inline: Define connection information within the action step.</td>
</tr>
<tr>
<td></td>
<td>• Use Connection Alias: Define connection information using the Connection Alias table. Using an alias eliminates the need to configure multiple credentials and connection information profiles when using an action in multiple environments. Likewise, if the connection information changes, you do not have to update your custom action.</td>
</tr>
</tbody>
</table>

To learn more about connections and credentials, see credentials, connections, and aliases.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
</table>
| Connection Alias | Specify the Connection & Credential alias record the system uses to run the action step. Requires a flow designer or admin to create or select an associated Connection record. Using an alias eliminates the need to configure multiple credentials and connection information profiles when using an action in multiple environments. Likewise, if the connection information changes, you do not have to update your custom action. To learn more about connections and credentials, see credentials, connections, and aliases.  

**Note:** This field is only visible when the Connection is Use Connection Alias.                                                                                                                                                                                                                                                                                                                                                     |
| Credential Alias | Specify the credential alias the system uses to run the action step. Requires a flow designer or admin to create or select an associated Credential record. Using an alias eliminates the need to configure multiple credentials when using an action in multiple environments. Likewise, if the credential information changes, you do not have to update your custom action. To learn more about connections and credentials, see credentials, connections, and aliases.  

**Note:** This field is only visible when the Connection is Define Connection Inline.                                                                                                                                                                                                                                                                                                                                                     |
| Use MID | The option to use a MID Server to run the REST step. Select this option to display the MID Application and Capabilities fields.                                                                                                                                                                                                                                                                                                                                                     |
| Base URL | The base URL for the REST request. If Use Connection Alias is selected, this field is read-only and displays the base URL associated with alias. If Define Connection Inline is selected, enter a base URL for the connection.                                                                                                                                                                                                                                                                                                                                                     |
| MID Application | Specify the capabilities the MID Server must support to be eligible for selection. The system runs the action step from a MID Server that supports the selected capabilities.  

**Note:** This field is only visible when Use MID is enabled.                                                                                                                                                                                                                                                                                                                                                     |
| Capabilities | Specify the capabilities the MID Server must support to be eligible for selection. The system runs the action step from a MID Server that supports the selected capabilities.  

**Note:** This field is only visible when Use MID is enabled.                                                                                                                                                                                                                                                                                                                                                     |
| Resource Path | Specify the path for the resource.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| HTTP Method | Specify the HTTP method to process the request.  

- GET  
- POST  
- PUT  
- PATCH  
- DELETE  

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<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Query Parameters</td>
<td>Specify the name-value pairs to pass to the REST endpoint. You can create these parameters manually, or drag input variables into the parameter fields, and then assign a value.</td>
</tr>
<tr>
<td>Headers</td>
<td>Specify the headers to send with the request. You can create headers manually, or drag input variables into the parameter fields, and then assign a value.</td>
</tr>
<tr>
<td>Request Type</td>
<td>Specify the format of the request. Options include.</td>
</tr>
<tr>
<td></td>
<td>• Text: A request in JSON, XML, or other text format.</td>
</tr>
<tr>
<td></td>
<td>• Binary: A request in a binary file format.</td>
</tr>
<tr>
<td></td>
<td>• Multipart: A request consisting of multiple content types.</td>
</tr>
<tr>
<td></td>
<td>• Form URL-Encoded: A request in a URL-encoded query.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This field is only editable when the HTTP Method is POST, PUT, PATCH, or DELETE.</td>
</tr>
<tr>
<td>Request Body [Text]</td>
<td>Enter the body of the request in JSON or XML format. The flow execution details display the response body as either a link to the embedded text viewer or the Sys ID of the attachment record containing the response.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This field is only editable when the Request Type is Text.</td>
</tr>
<tr>
<td>Attachment</td>
<td>Specify the Attachment record containing the request. You can look up this record in a prior step or define it as an input variable.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This field is only visible when the Request Type is Binary.</td>
</tr>
<tr>
<td>Name, Type, Value</td>
<td>Specify the content of a multiple part request. For each request part, specify its name, content type, and value. The name can be any valid string and the type can be any valid type. The value must match the content type. For attachments, specify:</td>
</tr>
<tr>
<td></td>
<td>• Type: attachment</td>
</tr>
<tr>
<td></td>
<td>• Value: The Sys ID of the Attachment record containing the content. You can look up this record in a prior step or define it as an input variable.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> These fields are only visible when the Request Type is Multipart.</td>
</tr>
<tr>
<td>Name, Value</td>
<td>Specify the content of a form URL-encoded request. Specify each part of the URL-encoded request with a name-value pair.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> These fields are only visible when the Request Type is Form URL-Encoded.</td>
</tr>
</tbody>
</table>
### Field Table

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Save As Attachment</td>
<td>Specify whether to save the response as a record in the Attachment [sys_attachment] table.</td>
</tr>
<tr>
<td>Attachment File Name</td>
<td>Specify the name of the attachment created by the REST response. For example, rest-response.txt.</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong>: This field is only visible when Save Response As Attachment is enabled.</td>
</tr>
<tr>
<td>Attachment File Record</td>
<td>Specify the target record to which the attachment is associated. Must be a data pill of type Record. For example, a specific incident record.</td>
</tr>
<tr>
<td></td>
<td>You can look up this record in a prior step or define it as an input variable. The flow execution details display the Sys ID of the associated record.</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong>: This field is only visible when Save Response As Attachment is enabled.</td>
</tr>
</tbody>
</table>

### REST Response

By default, the system limits the size of REST responses that are not saved as attachments to 5 MB. Direct REST responses that exceed this limit generate an error. To support larger response sizes, either save the response as an attachment or increase the response size limit with the `glide.pf.rest.response_payload_max_size` system property. This system property supports a maximum value of 10 MB.

### Script step

Add custom JavaScript to execute within a reusable action. While most core actions and steps fit common use cases, you can build a Script step to execute behavior not satisfied by the core steps.

**Note**: The IntegrationHub plugin further enhances the Script step to enable you to create integrations with external systems.

### Roles and availability

- Available as an Action Designer action step. Subject matter experts use the `action_designer` role to create a custom action with one or more action steps.

### Fields

The JavaScript step includes separate input and output variables that enable you to map JavaScript data to Flow Designer data. By defining input and output variables within the step, you can define what Flow Designer data is available within your script, and which scripting variables are available to other steps in your action.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required Runtime</td>
<td>The runtime environment required to support the script. Choices include:</td>
</tr>
<tr>
<td></td>
<td>• Instance: The action step runs the script from instance. Select this option when the script needs access to the ServiceNow API or instance data. This is the default value.</td>
</tr>
<tr>
<td></td>
<td>• MID: The action step runs the script from the MID Server. Select this option when the script needs access to MID Server script files and APIs. Selecting this option displays the Select MID Server Using field.</td>
</tr>
<tr>
<td></td>
<td>• Vanilla (Core JavaScript): The action step runs the script from either the instance or MID Server. Select this option when the script only needs the core JavaScript APIs and not the ServiceNow API or instance data.</td>
</tr>
<tr>
<td></td>
<td>The runtime you select determines the JavaScript objects and methods displayed in the Context-sensitive help.</td>
</tr>
<tr>
<td><strong>Note:</strong></td>
<td>This field is only visible when IntegrationHub is activated.</td>
</tr>
<tr>
<td>Select MID Server Using</td>
<td>Specify the MID Server selection process to use. Choices include:</td>
</tr>
<tr>
<td></td>
<td>• Any MID. The system runs the action step from any available MID Server.</td>
</tr>
<tr>
<td></td>
<td>• Use Connection Alias. The system runs the action using the connection alias you specify. Selecting this option displays the Connection Alias field.</td>
</tr>
<tr>
<td></td>
<td>• Use Inline Selection. The system runs the action using the connection details you specify in the action. Selecting this option displays the Host, MID Application, and Capabilities fields.</td>
</tr>
<tr>
<td><strong>Note:</strong></td>
<td>This field is only visible when IntegrationHub is activated, and you select MID from Required Runtime.</td>
</tr>
<tr>
<td>Connection Alias</td>
<td>Specify the Connection &amp; Credential alias record the system uses to run the action step. Requires a flow designer or admin to create or select an associated Connection record. Using an alias eliminates the need to configure multiple credentials and connection information profiles when using an action in multiple environments. Likewise, if the connection information changes, you do not have to update your custom action. To learn more about connections and credentials, see credentials, connections, and aliases. Only aliases of connection type Basic are supported.</td>
</tr>
<tr>
<td><strong>Note:</strong></td>
<td>This field is only visible when IntegrationHub is activated, and you select Use Connection Alias from Select MID Server Using.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Host</td>
<td>The fully-qualified domain name of the MID Server where the system runs the action step. For example, mid-server.domain.com.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This field is only visible when IntegrationHub is activated, and you select Use Inline Selection from Select MID Server Using.</td>
</tr>
<tr>
<td>MID Application</td>
<td>Specify the application the MID Server must support to be eligible for selection. The system runs the action step from a MID Server that supports the selected application.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This field is only visible when IntegrationHub is activated, and you select Use Inline Selection from Select MID Server Using.</td>
</tr>
<tr>
<td>Capabilities</td>
<td>Specify the capabilities the MID Server must support to be eligible for selection. The system runs the action step from a MID Server that supports the selected capabilities.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This field is only visible when IntegrationHub is activated, and you select Use Inline Selection from Select MID Server Using.</td>
</tr>
<tr>
<td>Input variables</td>
<td>Name-value pairs that represent data from the action, enabling you to use action inputs and data from other steps within a script.</td>
</tr>
<tr>
<td>Script</td>
<td>Script that executes within the action. To access input and output variables in your script, use the global objects inputs and outputs. For example, inputs.myVariable.</td>
</tr>
<tr>
<td></td>
<td>Scripts in Flow Designer execute either on the instance or from a MID Server.</td>
</tr>
<tr>
<td></td>
<td>For available classes and methods, see the JavaScript API Context-sensitive help or the JavaScript API reference.</td>
</tr>
<tr>
<td>Output variables</td>
<td>Map JavaScript output to Flow Designer data pills. Define output variables when you want other steps in the action to use the script output.</td>
</tr>
</tbody>
</table>

**Example**

This example builds a JSON payload that can be easily updated or changed and added to a subsequent REST step.

**Note:** REST step is not available on the base system and requires a separate IntegrationHub subscription.
By creating an output variable that represents the payload, you can drag the [Payload] data pill into the REST step Body field.

**Send Email step**

Send an email to specified users or groups as an action in a flow.

**Roles and availability**

- Available as an Action Designer action step. Subject matter experts use the action_designer role to create a custom action with one or more action steps.
Fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>To</td>
<td>The main recipients of the email. Enter a list of user email addresses separated by commas or white spaces. You can also drag-and-drop data pills that contain email addresses into the field, such as a User record. For example, if your action involves an incident record and you want to send an email to the group assigned to the incident, drag the [Assignment group] data pill from the data panel.</td>
</tr>
<tr>
<td>CC</td>
<td>Additional recipients copied on this email. Enter a list of user email addresses separated by commas or white spaces. You can also drag-and-drop data pills that contain email addresses into the field.</td>
</tr>
<tr>
<td>BCC</td>
<td>Additional recipients of this email, who are visible only to the sender (blind copied). Enter a list of user email addresses separated by commas or white spaces. You can also drag-and-drop data pills that contain email addresses into the field.</td>
</tr>
<tr>
<td>Subject</td>
<td>Subject of the email. You can enter text or drag-and-drop data pills into the field.</td>
</tr>
<tr>
<td>Body</td>
<td>The content of the message body. You can enter text or drag-and-drop data pills into the field.</td>
</tr>
</tbody>
</table>

Note: Flow Designer does not support the ${URI} parameter for creating a link to a record in the email message body. Instead, consider inserting the information from the record in the email body using data pills, or create a notification step.

Testing the email step

To verify that the email was generated when testing the action, review the email record in the Email [sys_email] table. The Headers field indicates whether the email was successfully generated. For example:

```
X-ServiceNow-Source:FlowDesigner-9ad2747b0b710300f4eb8bf637673a1e
Message-ID:<193756824.0.1508534586438@[10.0.66.70]>
X-ServiceNow-Generated:true
```

Update Record step

Update an existing record in a table. You can dynamically add and configure fields for the record, or use a template to set field values.
Roles and availability

• Available as an Action Designer action step. Subject matter experts use the action_designer role to create a custom action with one or more action steps.

Fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Record</td>
<td>The record to be updated. Drag-and-drop a record data pill or use the data pill picker to select a record.</td>
</tr>
<tr>
<td>Table</td>
<td>Read-only. Set to the table associated with the record.</td>
</tr>
<tr>
<td>Field Values</td>
<td>Set static or dynamic values of fields in the record. For example, to set the short description to a static value, select Short description and set the desired value. To add dynamic values, see Allow flow designers to dynamically set field values on page 1253.</td>
</tr>
</tbody>
</table>

Wait For Condition step

Pause the flow until the record value conditions are met.

Roles and availability

• Available as an Action Designer action step. Subject matter experts use the action_designer role to create a custom action with one or more action steps.

Fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Record</td>
<td>Drag-and-drop an input record or a record from a previous step.</td>
</tr>
<tr>
<td>Table</td>
<td>Read-only. Set to the table associated with the record.</td>
</tr>
<tr>
<td>Conditions</td>
<td>Conditions that the flow waits for. For example, if the condition is [State][is][Closed], the flow pauses until the condition is met. Once met, the flow moves on to the next step or action. Set static or dynamic conditions to filter records. To define a static condition applied each time the action runs, define the conditions with the condition builder. To enable flow designers to dynamically apply conditions, define an input of type Conditions and drag-and-drop the input data pill into the Conditions field.</td>
</tr>
</tbody>
</table>
Example

1. Wait For Condition step

<table>
<thead>
<tr>
<th>Record</th>
<th>action » incident x</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table</td>
<td>Incident [incident]</td>
</tr>
<tr>
<td>Conditions</td>
<td>All of these conditions must be met</td>
</tr>
<tr>
<td>State</td>
<td>is</td>
</tr>
</tbody>
</table>

Spokes

Add application-specific content to Flow Designer by installing spokes.

A *spoke* is a scoped application containing Flow Designer content dedicated to a particular application or record type. For example, the ITSM Spoke contains actions for managing Task records such as the Create Task action. Spokes are activated when their parent application is activated. For example, the ITSM Spoke is activated when the Incident, Problem, and Change applications are activated. Creating a spoke requires familiarity with application development as developers must add Flow Designer content to a scoped application.

**Table 452: Default spokes available**

<table>
<thead>
<tr>
<th>Spoke</th>
<th>Description</th>
<th>Plugin</th>
<th>Included with</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Benchmarks Spoke</strong> on page 1312</td>
<td>Provides read-only actions for the read-only Benchmark Recommendation Evaluator flow.</td>
<td>[com.sn_bm_client.spoke]</td>
<td><strong>Benchmarks</strong> application.</td>
</tr>
<tr>
<td><strong>Connect spoke</strong> on page 1312</td>
<td>Provides actions to automate the creation of conversations, to add users to a conversation, and to send messages to a conversation. These actions work with Connect API version 3 and later.</td>
<td>[com.glide.connect_v3plus.core.ah]</td>
<td><strong>Now Platform</strong></td>
</tr>
<tr>
<td>Spoke</td>
<td>Description</td>
<td>Plugin</td>
<td>Included with</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td><strong>Field Service Spoke on page 1313</strong></td>
<td>Provides actions for flow designers to use when creating Field Service Management business processes.</td>
<td>[com.snc.field_service.spoke]</td>
<td>Field Service Management application</td>
</tr>
<tr>
<td><strong>ITSM spoke on page 1314</strong></td>
<td>Provides flow and actions associated with ITSM. Requires the ITSM application suite.</td>
<td>[com.snc.itms.spoke]</td>
<td>IT Service Management application</td>
</tr>
<tr>
<td><strong>Visual Task Board (VTB) Spoke on page 1316</strong></td>
<td>Provides VTB actions for flow designers to manage the boards, lanes, cards, board members, and assignees.</td>
<td>[com.glide.ui.vtb.ah]</td>
<td>Now Platform</td>
</tr>
</tbody>
</table>

**IntegrationHub spokes**

These spokes require an IntegrationHub subscription.

<table>
<thead>
<tr>
<th>Spoke</th>
<th>Description</th>
<th>Plugin</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HipChat spoke on page 1331</strong></td>
<td>The HipChat Spoke provides actions which automate the creation of conversations, add users to a conversation, and send messages to a conversation.</td>
<td>[com.sn.hipchat.ah]</td>
</tr>
<tr>
<td><strong>Microsoft Teams spoke on page 1352</strong></td>
<td>The Microsoft Teams Spoke provides actions to automate sending messages about incidents and problems to MS Teams channel.</td>
<td>[com.sn.ms_teams.ah]</td>
</tr>
<tr>
<td>Spoke</td>
<td>Description</td>
<td>Plugin</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td><strong>ServiceNow eBonding spoke</strong> on page 1353</td>
<td>The ServiceNow eBonding Spoke provides some common integration design patterns through a common use case of synchronizing incidents across ServiceNow instances.</td>
<td>[com.glide.sn.ebonding.ah]</td>
</tr>
<tr>
<td><strong>REST step</strong> on page 1301</td>
<td>Enables the REST action step in Flow Designer.</td>
<td>[com.glide.hub.action_step.rest]</td>
</tr>
<tr>
<td><strong>Slack speak</strong> on page 1355</td>
<td>The Slack Speak provides actions that facilitate sending messages about incidents and problems to a channel.</td>
<td>[com.sn.slack.ah]</td>
</tr>
</tbody>
</table>

**Benchmarks Spoke**

Provides read-only actions for the read-only Benchmark Recommendation Evaluator flow.

The Benchmarks Spoke is designed for the Recommendations feature of the *Benchmarks* application.

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
<th>Action Inputs</th>
<th>Action Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create Recommendation Activity Records</td>
<td>Create or update recommendation activity records.</td>
<td>• Recommendation</td>
<td>N/A</td>
</tr>
<tr>
<td>Delete Recommendation Evaluations</td>
<td>Delete recommendation evaluations for the specified month.</td>
<td>• Activity record</td>
<td>N/A</td>
</tr>
<tr>
<td>Evaluate Recommendation Condition</td>
<td>Evaluate the conditions and script specified for the recommendation.</td>
<td>• Record count</td>
<td>• Result, Score</td>
</tr>
<tr>
<td></td>
<td>• Threshold</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Direction</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Recommendation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Activity record</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Connect spoke**

Provides actions to automate the creation of conversations, to add users to a conversation, and to send messages to a conversation. These actions work with Connect API version 3 and later.

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add Group Users to Task Conversation</td>
<td>Create a task conversation, and add all users of a group to it.</td>
</tr>
<tr>
<td>Add User to Task Conversation</td>
<td>Create a task conversation, and add a user to it.</td>
</tr>
<tr>
<td>Send Message to Task Conversation</td>
<td>Send a message to all users of a task conversation.</td>
</tr>
</tbody>
</table>
Customer Service Spoke


<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Get Case</td>
<td>Retrieve a case record using the case number. If multiple records are found, only the first record is returned.</td>
</tr>
<tr>
<td>Create Case</td>
<td>Create a case using one or more attributes. This action mimics the structure of the Case table (sn_customerservice_case) and exposes the fields present on the Case table.</td>
</tr>
<tr>
<td>Create Quick Case</td>
<td>Create a case using the customer, description, channel, priority, and category attributes.</td>
</tr>
<tr>
<td>Create Task on Case</td>
<td>Create a case task and optionally associate it with a case.</td>
</tr>
<tr>
<td>Update Case</td>
<td>Update a case by providing the case reference and the fields that you want to update.</td>
</tr>
<tr>
<td>Assign Case</td>
<td>Assign a case using matching rules. To use this action, you must first define the matching rules that match cases with resources (assignment groups, agents).</td>
</tr>
<tr>
<td>Escalate Case</td>
<td>Request case escalation. This action does not automatically approve escalation. Approval is based on the selected escalation template.</td>
</tr>
<tr>
<td>Escalate Account</td>
<td>Request account escalation. This action does not automatically approve escalation. Approval is based on the selected escalation template.</td>
</tr>
<tr>
<td>Add Work Note to Task</td>
<td>Add a work note to a task or to task extended objects (for example, a case or case task).</td>
</tr>
<tr>
<td>Add Comment to Task</td>
<td>Add a comment to a task or to task extended objects (for example, a case or case task).</td>
</tr>
</tbody>
</table>

Field Service Spoke

Provides actions for flow designers to use when creating Field Service Management business processes.

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Get Work Order</td>
<td>Retrieve a work order record using the work order number. If multiple records are found, only the first record is returned.</td>
</tr>
<tr>
<td>Create Work Order</td>
<td>Create a work order and optionally associate it with a case.</td>
</tr>
<tr>
<td>Update Work Order</td>
<td>Update a work order by providing the work order reference and the fields that you want to update.</td>
</tr>
<tr>
<td>Action</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Get Work Order Task</td>
<td>Retrieve a work order task record using the work order task number. If multiple records are found, only the first record is returned.</td>
</tr>
<tr>
<td>Create Work Order Task</td>
<td>Create a work order task and optionally associate it with a work order.</td>
</tr>
<tr>
<td>Update Work Order Task</td>
<td>Update a work order task by providing the work order task reference and the fields that you want to update.</td>
</tr>
<tr>
<td>Add Work Note to Task</td>
<td>Add a work note to a task or to task extended objects (for example, a work order or work order task).</td>
</tr>
</tbody>
</table>

**ITSM spoke**

Provides flow and actions associated with ITSM. Requires the ITSM application suite.

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add Comment</td>
<td>Adds a comment to a task record.</td>
</tr>
<tr>
<td>Add Worknote</td>
<td>Adds a work note to a task record.</td>
</tr>
<tr>
<td>Assign Incident to CI Support Group</td>
<td>Updates an incident record to assign it to the CI Support Group.</td>
</tr>
<tr>
<td>Create Catalog Task on Request</td>
<td>Creates a Catalog Task record from a Request record.</td>
</tr>
<tr>
<td>Create Catalog Task on Request Item</td>
<td>Creates a Catalog Task record from a Request Item record.</td>
</tr>
<tr>
<td>Create Change Task on Change Request</td>
<td>Creates a Change Task record from a Change Request record.</td>
</tr>
<tr>
<td>Create Emergency Change Request</td>
<td>Creates a Change Request record of type Emergency.</td>
</tr>
<tr>
<td>Create Emergency Request from Incident</td>
<td>Creates a Change Request record of type Emergency from an Incident record.</td>
</tr>
<tr>
<td>Create Incident</td>
<td>Creates an Incident record.</td>
</tr>
<tr>
<td>Create Incident Task on Incident</td>
<td>Creates an Incident Task record from an Incident record.</td>
</tr>
<tr>
<td>Create Normal Change Request from Incident</td>
<td>Creates a Change Request record of type Normal from an Incident record.</td>
</tr>
<tr>
<td>Create Problem from Incident</td>
<td>Creates a Problem record from an Incident record.</td>
</tr>
<tr>
<td>Create Request</td>
<td>Creates a Request record.</td>
</tr>
<tr>
<td>Create Standard Change Request</td>
<td>Creates a Change Request record of type Standard.</td>
</tr>
<tr>
<td>Action</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| Create Task  
[Core Action] | Creates a child task record for a Task table record. For example, creates an Incident Task record for an Incident record. |
| Create Standard Change Request from Incident | Creates a Change Request record of type Standard from an Incident record. |
| Update Assignee | Updates the Assigned to field of a Task table record. |
| Update Assignment Group | Updates the Assignment Group field of a Task table record. |

**Security Operations spoke**


**Security Incident Response flow templates**

The Security Incident Response flow templates are created using the *Flow Designer* on page 1205.

*Note:* Each of the flows is triggered when the Category in a security incident is set or changed.

<table>
<thead>
<tr>
<th>Template</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Security Incident Confidential Data Exposure flow template</td>
<td>Perform a series of tasks designed to handle the exposure of sensitive data.</td>
</tr>
<tr>
<td>Security Incident Denial of Service flow template</td>
<td>Perform a series of tasks designed to handle Denial of Service (DOS) attacks.</td>
</tr>
<tr>
<td>Security Incident Lost Equipment flow template</td>
<td>Perform a series of tasks designed to handle lost equipment.</td>
</tr>
<tr>
<td>Security Incident Malicious Software flow template</td>
<td>Perform a series of tasks designed to handle malicious software on your network.</td>
</tr>
<tr>
<td>Security Incident Phishing flow template</td>
<td>Perform a series of tasks designed to handle spear phishing emails on your network.</td>
</tr>
<tr>
<td>Security Incident Policy Violation flow template</td>
<td>Perform a series of tasks designed to handle security policy violations.</td>
</tr>
<tr>
<td>Security Incident Reconnaissance flow template</td>
<td>Perform a series of tasks designed to handle reconnaissance on your network.</td>
</tr>
<tr>
<td>Security Incident Rogue Server or Service flow template</td>
<td>Perform a series of tasks designed to handle activity from rogue servers or services affecting your network.</td>
</tr>
<tr>
<td>Security Incident Spam flow template</td>
<td>Perform a series of tasks designed to handle email spam on your network.</td>
</tr>
<tr>
<td>Security Incident Unauthorized Access flow template</td>
<td>Perform a series of tasks designed to handle unauthorized access to your network.</td>
</tr>
<tr>
<td>Template</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Security Incident Web/BBS Defacement flow template</td>
<td>Perform a series of tasks designed to handle vandalism directed against one of your BBS or web sites.</td>
</tr>
</tbody>
</table>

**Visual Task Board (VTB) Spoke**

Provides VTB actions for flow designers to manage the boards, lanes, cards, board members, and assignees.

### Table 453: Board Management Actions

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
<th>Action Inputs</th>
<th>Action Outputs</th>
</tr>
</thead>
</table>
| Create Freeform VTB Action    | Creates a Freeform VTB for any task type. The default lanes are: Todo, Doing, and Done. These lanes can be modified with actions: Add Lane, Rename Lane, Reorder Lane, and Delete Lane | • Name  
• Board Owner  
• Default view  
• Label visibility  
• Picker visibility  
• Background color | • Board record |
| Create Flexible VTB Action    | Creates a Flexible VTB bound to a single Task table. The default lanes are: Todo, Doing, and Done. These lanes can be modified with actions: Add Lane, Rename Lane, Reorder Lane, and Delete Lane | • Name  
• Task table  
• Filter  
• Board Owner  
• Default view  
• Label visibility  
• Picker visibility  
• Background color | • Board record |
| Create Guided VTB Action      | Creates a data-driven VTB bound to a single Task table along with the fields the lanes are derived. | • Name  
• Task table  
• Land field  
• Filter  
• Board Owner  
• Default view  
• Label visibility  
• Picker visibility  
• Background color | • Board record |
| Add VTB Member Action         | Add a user to a VTB. Only members of the VTB can access the board, Any VTB member can add other members. | • Board record  
• User record | N/A |
<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
<th>Action Inputs</th>
<th>Action Outputs</th>
</tr>
</thead>
</table>
| Remove VTB Member      | Remove a user from a VTB. Only members of a VTB can access the board. Any VTB member can remove other members. | • Board record  
• User record                               | N/A                                                        |

Table 454: Lane Management Actions

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
<th>Action Steps</th>
<th>State</th>
</tr>
</thead>
</table>
| Add VTB lane      | Add a lane to a Freeform or Flexible VTB. This action does not apply to Guided boards, which are constrained to fixed lanes based on fields configured.                                                           | • Board record  
• Lane name                                                                 | VTB lane record   |
| Rename VTB Lane   | Rename an existing lane on a Freeform or Flexible VTB.                                                                                                                                                       | • Lane record  
• New lane name                                                               | N/A              |
| Reorder VTB Lane  | Reorder lanes on any VTB.                                                                                                                                                                                     | • Lane record  
• New lane name                                                               | N/A              |
| Delete VTB Lane   | Delete an existing lane from a Freeform or Flexible VTB.                                                                                                                                                     | • Lane record                                                               | N/A              |

Table 455: Card Management Actions

<table>
<thead>
<tr>
<th>Flow/Action</th>
<th>Description</th>
<th>Action Steps</th>
<th>State</th>
</tr>
</thead>
</table>
| Create VTB Card      | Create a VTB card on a Freeform board for a task.                                                                                             | • Lane record  
• Task record                                                             | Card record     |
| Assign VTB Card      | Assign a user to a VTB card.                                                                                                                   | • Card record  
• User record                                                             | N/A              |
<table>
<thead>
<tr>
<th>Flow/Action</th>
<th>Description</th>
<th>Action Steps</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Move VTB Card</td>
<td>Move a VTB card from one lane to another lane.</td>
<td>• Card record&lt;br&gt;• Lane record</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Note: For Flexible boards, use the Update Record action to change the state of the underlying task. For Guided boards, this action changes the field on the task associated with that card.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remove Assignee from VTB Card</td>
<td>Remove an assignee from a card.</td>
<td>• Card record</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Flow execution details**

View runtime information about a flow directly from the design environment such as the current state, actions run, and values produced. Open related records from embedded Now Platform editors or in a new tab.

Each time a flow runs, the system stores information about the configuration and runtime values produced, which process analysts can view from the Flow Designer design environment Flow Executions tab. Select a flow execution to open its associated execution details page.

To disable the flow execution details, add the com.snc.process_flow.reporting.enabled system property to the System Properties [sys_properties] table and set the value to false. If disabled, details are not saved for actions in the flow. However, the flow context record and related log messages are available. If a flow runs while the property is false, execution details are never available for the flow, even if the property value changes. If a flow runs while the property is true, execution details are always available for the flow, even if the property value changes.
### Figure 280: Sample execution details of the VTB Sample Flow

Each execution details page displays:
• Calling source
• Flow state
• Related record options
• Flow Statistics

**Calling source**

The calling source lists what started a flow or subflow.

<table>
<thead>
<tr>
<th>Source</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow Designer Test</td>
<td>The flow started because a user selected the Test option from the Flow Designer interface. The flow trigger conditions were ignored.</td>
</tr>
<tr>
<td>CRUD Trigger</td>
<td>The flow started when the record-based trigger conditions were met.</td>
</tr>
<tr>
<td>Scheduled Trigger</td>
<td>The flow started when the schedule-based trigger conditions were met.</td>
</tr>
<tr>
<td>Metric Trigger</td>
<td>The flow started when the MetricBase trigger conditions of a MetricBase application on page 1565 were met.</td>
</tr>
<tr>
<td>Service Catalog Trigger</td>
<td>The flow started when a Service Catalog item was requested.</td>
</tr>
<tr>
<td>Script</td>
<td>The flow started from an API method call in a script, such as a business rule.</td>
</tr>
<tr>
<td>Background Script</td>
<td>The flow started from an API method call in the Scripts - Background module.</td>
</tr>
</tbody>
</table>

**Flow state**

All active flows are in one of these states.

**Completed**  
The flow successfully ran all actions. The flow statistics display configuration and run-time details for each action.

**Waiting**  
The flow paused on an action that is waiting for some condition to be met before continuing. The flow statistics display configuration and run-time details for completed actions and configuration details for any actions waiting for a condition to be met. Flows in the Waiting state display a Cancel Flow UI action in the header.

**Error**  
The flow stopped with an error. The flow statistics display configuration and run-time details for completed actions and configuration details for the action that produced the error. Flows in the Error state display a Go to error UI action in the header.
### Related record options

From the Execution details page, you can access records related to the current flow.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refresh Flow Data</td>
<td>Use this option to update flow runtime data.</td>
</tr>
<tr>
<td>Open Flow</td>
<td>Use this option to make configuration changes and publish a new instance of the flow. Changing the flow configuration does not change any currently active flow.</td>
</tr>
<tr>
<td>Open Context Record</td>
<td>Use this option to view the flow state, run duration, and related log entries from a standard form view. This option opens the context record in a new tab.</td>
</tr>
<tr>
<td>Open Flow Logs</td>
<td>Use this link to view detailed log information about each action. This link opens the log entries list in a new tab.</td>
</tr>
<tr>
<td>Open Current Record</td>
<td>For flows that have a record-based trigger, use this link to view the triggering record in a pop-up window.</td>
</tr>
<tr>
<td>Open Action</td>
<td>Use this link to make configuration changes and publish a new instance of the action. Changing the action configuration does not change any currently active flow. This link is unavailable for ServiceNow-provided core actions.</td>
</tr>
</tbody>
</table>

### Flow statistics

Use flow statistics to see configuration details and run-time values for each flow component. Clicking a trigger or action expands the row and displays configuration and run-time details about it.
The following types of execution details are available.

**Integration Metadata**  
Use Integration Metadata to view transaction data such as connection and credential used, target host, and payload size. Integration Metadata only displays for integration steps and requires a separate IntegrationHub subscription. For more information, see Integration steps on page 1357.

**Configuration Details**  
Use the list of input variables to identify any configuration errors with the action. Each variable has its own row displaying its name, data type, configuration settings, and run-time value. The configuration settings display dynamic values as pills. The run-time values display generated records as a link.

**Output Data**  
Use the list of output variables to identify any configuration errors with the action.

**Logs**  
Use the log entries to identify potential processing or performance issues. Each log entry has its own row displaying the creation date, log level, and log message. If the action does not generate any logs, the statistics displays the string No Logs.

**Steps**  
Use the list of steps to identify any configuration errors with the action. Each step has its own row displaying the variable name, data type, configuration settings, and run-time value. Core actions do not display steps because users cannot change their configuration.

Change the com.snc.process_flow.reporting.serialized.val_size_limit system property to truncate runtime values in the flow execution details step configuration. To learn more, see Flow Designer system properties on page 1235.

**Run duration**  
Use the run duration to identify potential processing or performance issues. Each action and step displays the duration in milliseconds. System quota rules prevent any action from running longer than a minute.

**Embedded text viewer**

Flow Designer displays large text-based configuration and runtime output records such as email output, XML payloads, or script steps using an embedded text viewer. The embedded text viewer can format text as HTML, plain text, or color-coded JavaScript. For script steps, the text viewer highlights code lines containing errors.
(function execute(inputs, outputs) {
    var vtbLane = new GlideRecord('vtb_lane');
    vtbLane.addQuery('board', inputs.vtbBoard.sys_id);
    vtbLane.query();
    vtbLane.next();

    var vtbCard = new GlideRecord('vtb_card');
    vtbCard.task = inputs.task.sys_id;
    vtbCard.board = inputs.vtbBoard.sys_id;
    vtbCard.lane = vtbLane.sys_id;
    vtbCard.insert();

    outputs.vtbCard = vtbCard;
})(inputs, outputs);
**Viewing results for each item in flow logic**

Flow Designer displays a selector control to view the configuration and run-time results for each item processed by flow logic. Select a record number to see its configuration and run-time details.
<table>
<thead>
<tr>
<th>Action</th>
<th>Trigger</th>
<th>Status</th>
<th>Start Time</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Open Flow Log</td>
<td>Completed</td>
<td>2017-01-18 00:03:02</td>
<td>488ms</td>
</tr>
<tr>
<td></td>
<td>Open Current Record</td>
<td>Completed</td>
<td>2017-01-18 00:03:02</td>
<td>8ms</td>
</tr>
<tr>
<td></td>
<td>Core Action</td>
<td>Completed</td>
<td>2017-01-18 00:03:02</td>
<td>436ms</td>
</tr>
<tr>
<td></td>
<td>Core Action</td>
<td>Completed</td>
<td>2017-01-18 00:03:02</td>
<td>276ms</td>
</tr>
</tbody>
</table>
Flow administration modules

Identify and troubleshoot potential issues by reviewing flow executions, the event queue, and the operations dashboard.

Flow Designer provides administrators and flow operators these modules to manage flows.

**Today's Executions**
Displays a list of flow context records for flows run today. Use this information to identify flows run today.

**Active flows**
Displays a list of flow context records for running flows where the State is Waiting. Use this information to identify flows that are waiting for a trigger or condition to continue.

**Event Queue**
Displays a filtered list of event records where the Queue is flow_engine and the State is Ready. Use this information to identify flows that are waiting on event processing.

**Operations Dashboard**
Displays a responsive dashboard containing a count of flows run and the average flow runtime. View statistics for today or over the last 30 days. Use this information to determine the health and performance of flow execution.

**Usage Overview**
Displays transaction counts between your instance and third-party systems. The Usage Overview is not available on the base system and requires a separate IntegrationHub subscription.

IntegrationHub

Automate integration tasks using ServiceNow-built components for Flow Designer, or develop custom integrations. Requires a separate subscription.

Capabilities

IntegrationHub enables execution of third-party APIs as a part of a flow when a specific event occurs in ServiceNow. These integrations, referred to as spokes, are easy to configure and enable you to quickly add powerful actions without the need to write a script. For example, you can post a message and incident details in a Slack channel when a high priority incident is created.

IntegrationHub provides the following functionality:

**Spokes for base system integrations**
Using IntegrationHub actions in Flow Designer, you can:

- Post messages and ServiceNow incident, problem, and change record details to HipChat, Slack, or Microsoft Teams communications channels.
Create custom integrations

Build custom integrations with Action Designer using a REST step on page 1301 or a Script step on page 1304.

Automate the administration of servers and applications in your network

Use custom actions to delegate Flow Designer processes to a MID Server on page 1579 in your network. For example, actions that use the PowerShell step on page 1296 or REST step on page 1301.

IntegrationHub takes advantage of aliases to manage connection information and credentials when integrating with external systems. Using an alias eliminates the need to configure multiple credentials and connection information profiles when using multiple environments. IntegrationHub only requires an alias, which then resolves to use the correct credentials and connection information during runtime. Learn more about Introduction to credentials, connections, and aliases on page 1010.

Benefits

IntegrationHub provides process owners and developers these benefits.

- Consolidates multiple Now Platform automation capabilities into a single environment so process owners and developers can build and visualize business processes and integrations from a single interface.
- Extends Flow Designer content to integrate business processes with external systems.
- Promotes business process automation by enabling subject matter experts to develop and share spokes with flow designers.
- Provides natural-language-descriptions of integration logic to help non-technical users understand triggers, actions, inputs, and outputs.

Development process

When developing a custom integration, develop all actions for the integration within a scoped application. When deployed to a target instance, these actions are grouped as a spoke in Flow Designer. Brand the spoke by adding a custom icon to the application record. To learn more about application development, see Applications.

When developing spokes, flow and action designers typically perform these application development tasks.

1. Create a scoped application on a development instance to build spokes.
2. Publish a test version of the scoped application to the application repository.
3. Deploy the scoped application to a test instance from the application repository.
4. Test the scoped application on the test instance.
5. When working as expected, publish the scoped application in one of the following ways.
   • Publish to the application repository for deployment on production instances.
   • Publish to the ServiceNow Store as an application that customers can request for their environments.
- Publish to ServiceNow Share to provide content to other customers in the ServiceNow community.

Review Flow Designer design considerations in the *Architecture Overview* on page 1208.

**Request IntegrationHub**

Flow Designer is a Now Platform feature that enables you to automate processes within a single ServiceNow instance. Use base system actions or Action Designer steps to manipulate records, send emails, trigger notifications, and expose scripts as code-less components. Create integrations with external systems by requesting IntegrationHub. IntegrationHub enables base system components in Action Designer, such as the Script step, to call external systems using integration APIs and activates protocol steps like REST.

Role required: none

The ServiceNow IntegrationHub Installer plugin (com.glide.hub.integrations) requires a separate subscription and must be activated by ServiceNow personnel. This plugin includes demo data and activates related plugins if they are not already active.

<table>
<thead>
<tr>
<th>Plugin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HipChat Spoke for ServiceNow IntegrationHub [com.sn.hipchat.ah]</td>
<td>The HipChat Spoke for ServiceNow IntegrationHub provides actions that a Process Analyst can use when designing flows. The actions allow them to automate the creation of conversations, add users to a conversation, and send messages to a conversation.</td>
</tr>
<tr>
<td>Slack Spoke for ServiceNow IntegrationHub [com.sn.slack.ah]</td>
<td>The Slack Spoke for ServiceNow IntegrationHub provides actions that a Process Analyst can use when designing flows. The actions allow them to send messages about incidents and problems to a channel.</td>
</tr>
<tr>
<td>Microsoft Teams Spoke for ServiceNow IntegrationHub [com.sn.ms_teams.ah]</td>
<td>The Microsoft Teams Spoke for ServiceNow IntegrationHub provides actions that a Process Analyst can use when designing flows to automate sending messages about Incidents and Problems to an MS Teams channel.</td>
</tr>
<tr>
<td>Microsoft AD Spoke for IntegrationHub [com.sn.ad.spoke]</td>
<td>Create, delete, and manage objects in Microsoft Active Directory, such as users, groups, and computers.</td>
</tr>
<tr>
<td>Microsoft Azure AD Spoke for IntegrationHub [com.sn.azure_ad.spoke]</td>
<td>Manage users, security groups, and office groups. Apply licenses and provision users in Office 365.</td>
</tr>
</tbody>
</table>
To purchase a subscription, contact your ServiceNow account manager. The account manager can arrange to have the plugin activated on your organization's production and sub-production instances, generally within a few days.

If you do not have an account manager, decide to delay activation after purchase, or want to evaluate the product on a sub-production instance without charge, follow these steps.

1. In the HI Service Portal, click Service Requests Activate Plugin.
2. Fill out the form.

<table>
<thead>
<tr>
<th>Target Instance</th>
<th>Instance on which to activate the plugin.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plugin Name</td>
<td>Name of the plugin to activate.</td>
</tr>
<tr>
<td>Specify the date and time you would like this plugin to be enabled</td>
<td>Date and time must be at least 2 business days from the current time.</td>
</tr>
</tbody>
</table>

**Note:** Plugins are activated in two batches each business day in the Pacific time zone, once in the morning and once in the evening. If the plugin must be activated at a specific time, enter the request in the Reason/Comments.

| Reason/Comments | Provide any information that would be helpful for the ServiceNow personnel activating the plugin. For example, if you need the plugin activated at a specific time instead of during one of the default activation windows. |

3. Click Submit.

**IntegrationHub available spokes**

Review the integration-specific flows and actions available to each spoke.

<table>
<thead>
<tr>
<th>Spoke</th>
<th>Description</th>
<th>Plugin</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HipChat spoke</strong> on page 1331</td>
<td>The HipChat Spoke provides actions which automate the creation of conversations, add users to a conversation, and send messages to a conversation.</td>
<td>[com.sn.hipchat.ah]</td>
</tr>
<tr>
<td>Spoke</td>
<td>Description</td>
<td>Plugin</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td><strong>Microsoft AD spoke</strong> on page 1333</td>
<td>Create, delete, and manage objects in Microsoft Active Directory, such as users, groups, and computers.</td>
<td>[com.sn.ad.spoke]</td>
</tr>
<tr>
<td><strong>Microsoft Azure AD spoke</strong> on page 1344</td>
<td>Manage users, security groups, and office groups. Apply licenses and provision users in Office 365.</td>
<td>[com.sn.azure_ad.spoke]</td>
</tr>
<tr>
<td><strong>Microsoft Teams spoke</strong> on page 1352</td>
<td>The Microsoft Teams Spoke provides actions to automate sending messages about incidents and problems to MS Teams channel.</td>
<td>[com.sn.ms_teams.ah]</td>
</tr>
<tr>
<td><strong>ServiceNow eBonding spoke</strong> on page 1353</td>
<td>The ServiceNow eBonding Spoke provides some common integration design patterns through a common use case of synchronizing incidents across ServiceNow instances.</td>
<td>[com.glide.sn.ebonding.ah]</td>
</tr>
<tr>
<td><strong>REST step</strong> on page 1301</td>
<td>Enables the REST action step in Flow Designer.</td>
<td>[com.glide.hub.action_step.rest]</td>
</tr>
<tr>
<td><strong>Slack spoke</strong> on page 1355</td>
<td>The Slack Spoke provides actions that facilitate sending messages about incidents and problems to a channel.</td>
<td>[com.sn.slack.ah]</td>
</tr>
</tbody>
</table>

### HipChat spoke

The HipChat spoke provides actions which post messages and ServiceNow incident, problem, and change record details to a HipChat conversation.

### HipChat actions

The HipChat spoke is an available integration through IntegrationHub. You can specify the following HipChat actions within a flow:

**Table 457:**

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post a Message</td>
<td>Send a message to a HipChat room. Specify the Room Notification URL, Auth Token, and Message to send.</td>
</tr>
<tr>
<td>Post Change Details</td>
<td>Send details about a ServiceNow change record to a HipChat room. Specify the Room Notification URL, Auth Token, and Change record to send.</td>
</tr>
<tr>
<td>Post Incident Details</td>
<td>Send details about a ServiceNow incident record to a HipChat room. Specify the Room Notification URL, Auth Token, and Incident record to send.</td>
</tr>
<tr>
<td>Action</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Post Problem Details</td>
<td>Send details about a ServiceNow problem record to a HipChat room. Specify the Room Notification URL, Auth Token, and Problem record to send.</td>
</tr>
</tbody>
</table>

HipChat Inputs

The following inputs are common to the HipChat actions:

Table 458:

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Required] Room Notification URL</td>
<td>The HipChat notification REST API URL. Example: <a href="https://api.hipchat.com/v2/%7Broom">https://api.hipchat.com/v2/{room</a> name}/ah-test/notification</td>
</tr>
<tr>
<td>[Required] Auth Token</td>
<td>You need an access token to send notifications. Refer to the HipChat API access token guide for details.</td>
</tr>
<tr>
<td>[Optional] Additional Message</td>
<td>Add a message to the record details.</td>
</tr>
<tr>
<td>[Optional] Override Default Field</td>
<td>You can provide a comma-separated list of field names to send instead of the default fields. Default fields are Short Description, Category, State, Priority, and Assignment Group.</td>
</tr>
</tbody>
</table>

Example

You can add a HipChat Post Incident Details action to a flow which identifies high priority incidents and who they are assigned to.

![Flow Diagram]
Microsoft AD spoke

Create, delete, and manage objects in Microsoft Active Directory, such as users, groups, and computers. The AD spoke is an available integration through IntegrationHub. You can specify the following AD actions within a flow.

This spoke uses the AD Connection & Credential Alias record. To use these actions, you must create a Connection record and a Credential record and associate them with the AD Connection & Credential Alias record. To learn more about connections and credentials, see Introduction to credentials, connections, and aliases on page 1010.

To use these actions, your instance must have a MID Server set up and configured to use PowerShell. For more information about running actions on the MID Server, see Integration steps on page 1357. For information about the MID Server, see MID Server on page 1579.

Create Computer

Creates a Computer Account in Active Directory (AD).

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Name</td>
<td>Name of the computer associated with the Computer Account. Must be unique in AD.</td>
</tr>
<tr>
<td>Description</td>
<td>Additional information about the Computer Account.</td>
</tr>
<tr>
<td>Organizational Unit</td>
<td>Organizational Unit (OU) the Computer Account will be created in.</td>
</tr>
<tr>
<td>Display Name</td>
<td>User-friendly name assigned to a computer.</td>
</tr>
<tr>
<td>DNS Host Name</td>
<td>Fully qualified domain name associated with the computer.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in AD occurs.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

Delete Computer

Deletes a computer from Active Directory (AD).

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Name</td>
<td>Name of the computer to be deleted. If the computer does not exist in Active Directory, the Status output is set to Error.</td>
</tr>
</tbody>
</table>
### Disable Computer

Disables a computer account in Active Directory (AD).

**Table 463: Inputs**

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Name</td>
<td>Name of the computer to be disabled. If the computer does not exist in Active Directory, the Status output is set to Error.</td>
</tr>
</tbody>
</table>

**Table 464: Outputs**

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in AD occurs.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

### Enable Computer

Enables a computer account in Active Directory (AD).

**Table 465: Inputs**

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Name</td>
<td>Name of the computer to be enabled. If the computer does not exist in Active Directory, the Status output is set to Error.</td>
</tr>
</tbody>
</table>

**Table 466: Outputs**

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in AD occurs.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

### Get Computer OU

Gets the Organizational Unit (OU) of a Computer Account.
Table 467: Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Name</td>
<td>Name of the computer to retrieve the OU for. If the computer does not exist in Active Directory, the Status output is set to Error.</td>
</tr>
</tbody>
</table>

Table 468: Outputs

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in AD occurs.</td>
</tr>
<tr>
<td>Organizational Unit</td>
<td>OU associated with the Computer Name passed as input. Populated only when the query is successful.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

**Is Computer Enabled**

Checks the status of the specified computer account in Active Directory (AD).

Table 469: Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Name</td>
<td>Name of the computer to check the status of. If the computer does not exist in Active Directory, the Status output is set to Error.</td>
</tr>
</tbody>
</table>

Table 470: Outputs

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in AD occurs.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
<tr>
<td>Answer</td>
<td>True if the account is enabled; otherwise false.</td>
</tr>
</tbody>
</table>

**Move Computer to OU**

Changes the Organizational Unit (OU) of a Computer Account in Active Directory (AD).

Table 471: Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Name</td>
<td>Computer to change the OU for. If the computer does not exist in Active Directory, the Status output is set to Error.</td>
</tr>
<tr>
<td>Input</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Organizational Unit</td>
<td>New OU to set for the computer. The OU input should be set to the Distinguished Name associated with the OU, not the Relative Distinguished Name (RDN). For example, OU=InnerMost,OU=Nested Parent,DC=corp,DC=ServiceNowADDomain,DC=com. If the OU does not exist in AD, the Status output is set to Error.</td>
</tr>
</tbody>
</table>

**Table 472: Outputs**

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in AD occurs.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

**Add User to Group**

Adds an existing user to a group in Active Directory (AD).

**Table 473: Inputs**

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Name</td>
<td>Name of the group to add the user to. If the specified Group Name does not exist in AD, the Status output is set to Error.</td>
</tr>
<tr>
<td>User Name</td>
<td>Name of the user to add to the group. If the specified User Name does not exist in AD, the Status output is set to Error.</td>
</tr>
</tbody>
</table>

**Table 474: Outputs**

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in AD occurs.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

**Create Group**

Creates a group in Active Directory (AD).

**Table 475: Inputs**

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Name</td>
<td>Name of the group to create.</td>
</tr>
<tr>
<td>Description</td>
<td>Additional information about the group you are creating.</td>
</tr>
</tbody>
</table>
Organizational Unit

Organizational Unit (OU) the group will be created in. Use a relative path. For example, if the full OU path is OU=InnerMost,OU=Nested Parent,DC=corp,DC=ServiceNowADDomain,DC=com, the relative path is OU=InnerMost,OU=Nested Parent.

Group Type

Type of group in AD. Group types include:
- Global distribution group
- Domain local distribution group
- Universal distribution group
- Global security group
- Domain local security group
- Universal security group

Table 476: Outputs

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in AD occurs.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

Delete Group

Deletes a group from Active Directory (AD).

Table 477: Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Name</td>
<td>Name of the group to delete. If the specified Group Name does not exist in AD, the Status output is set to Error.</td>
</tr>
</tbody>
</table>

Table 478: Outputs

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in AD occurs.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

Is User in Group

Checks if an existing user is a member of a group in Active Directory (AD).
Table 479: Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Name</td>
<td>Name of the group to check the membership status. If the specified Group Name does not exist in AD, the Status output is set to Error.</td>
</tr>
<tr>
<td>User Name</td>
<td>Name of the user to check membership for in the group. If the specified User Name does not exist in AD, the Status output is set to Error.</td>
</tr>
</tbody>
</table>

Table 480: Outputs

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in AD occurs.</td>
</tr>
<tr>
<td>Answer</td>
<td>True if the user is in the group; otherwise false. Populated only if the status is Success.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

Remove User From Group

Removes an existing user from a group in Active Directory (AD).

Table 481: Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Name</td>
<td>Name of the group to remove the user from. If the specified Group Name does not exist in AD, the Status output is set to Error.</td>
</tr>
<tr>
<td>User Name</td>
<td>Name of the user to remove from the group. If the specified User Name does not exist in AD, the Status output is set to Error.</td>
</tr>
</tbody>
</table>

Table 482: Outputs

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in AD occurs.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

Is User Account Locked

Checks the locked status of the specified user account in Active Directory (AD).
Table 483: Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Name</td>
<td>Name of the user to check status for. If the specified User Name does not exist in AD, the Status output is set to Error.</td>
</tr>
</tbody>
</table>

Table 484: Outputs

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in AD occurs.</td>
</tr>
<tr>
<td>Answer</td>
<td>True if the user account is locked; otherwise false. Populated only if the status is Success.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

Create User

Creates a user with no password in Active Directory (AD). To enable a user to set a password, log in to AD, create a default password for the user, and enable password reset.

Table 485: Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Name</td>
<td>Name of the user to create. If the specified User Name exists in AD, the Status output is set to Error.</td>
</tr>
<tr>
<td>First Name</td>
<td>First name of the user to create.</td>
</tr>
<tr>
<td>Last Name</td>
<td>Last name of the user to create.</td>
</tr>
<tr>
<td>Display Name</td>
<td>Name to display in the address book for the user.</td>
</tr>
<tr>
<td>Email Address</td>
<td>Email address of the user to create.</td>
</tr>
<tr>
<td>Mobile</td>
<td>Mobile phone number of the user to create.</td>
</tr>
<tr>
<td>Job Title</td>
<td>Job title of the user to create.</td>
</tr>
<tr>
<td>Department</td>
<td>Name of the department of the user to create.</td>
</tr>
<tr>
<td>Street Address</td>
<td>Street address of the user to create.</td>
</tr>
<tr>
<td>City</td>
<td>City of the user to create.</td>
</tr>
<tr>
<td>State</td>
<td>State of the user to create.</td>
</tr>
<tr>
<td>Country</td>
<td>Country of the user to create.</td>
</tr>
</tbody>
</table>

Table 486: Outputs

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in AD occurs.</td>
</tr>
</tbody>
</table>
**Delete User**

Deletes a user from Active Directory (AD).

**Table 487: Inputs**

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Name</td>
<td>Name of the user to delete. If the specified User Name does not exist in AD, the Status output is set to Error.</td>
</tr>
</tbody>
</table>

**Table 488: Outputs**

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in AD occurs.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

**Disable User**

Disables a user account in Active Directory (AD).

**Table 489: Inputs**

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Name</td>
<td>Name of the user to disable. If the specified User Name does not exist in AD, the Status output is set to Error.</td>
</tr>
</tbody>
</table>

**Table 490: Outputs**

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in AD occurs.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

**Enable User**

Enables a user account in Active Directory (AD).
Table 491: Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Name</td>
<td>Name of the user to enable. If the specified User Name does not exist in AD, the Status output is set to Error.</td>
</tr>
</tbody>
</table>

Table 492: Outputs

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in AD occurs.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

Is User Enabled

Checks the status of a user account in Active Directory (AD).

Table 493: Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Name</td>
<td>Name of the user to check the status for. If the specified User Name does not exist in AD, the Status output is set to Error.</td>
</tr>
</tbody>
</table>

Table 494: Outputs

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in AD occurs.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
<tr>
<td>Answer</td>
<td>True if the account is enabled; otherwise false.</td>
</tr>
</tbody>
</table>

Unlock AD Account

Unlocks a user account in Active Directory (AD).

Table 495: Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Name</td>
<td>Name of the user to unlock the account for. If the specified User Name does not exist in AD, the Status output is set to Error.</td>
</tr>
</tbody>
</table>
Table 496: Outputs

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in AD occurs.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

**Update User Home Location**

Updates the Home Directory for a User in Active Directory (AD).

Table 497: Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Name</td>
<td>Name of the user to update the home directory for. If the specified User Name does not exist in AD, the Status output is set to Error.</td>
</tr>
<tr>
<td>Home Directory</td>
<td>New directory location for the user.</td>
</tr>
</tbody>
</table>

Table 498: Outputs

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in AD occurs.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

**Create AD Object**

Creates an object of any type supported in Active Directory (AD).

Table 499: Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object Name</td>
<td>Name of the object to create. If the specified object exists in AD, the Status output is set to Error.</td>
</tr>
<tr>
<td>Object Data</td>
<td>JSON object of attributes to apply to the object. If an unsupported attribute is included, the action fails and the Status output is set to Error. For example,{&quot;description&quot; : &quot;This group organizes all IT super admins&quot;}.</td>
</tr>
<tr>
<td>Organizational Unit</td>
<td>OU path to create the object in. Use a relative path. For example, if the full OU path is OU=InnerMost,OU=Nested Parent,DC=corp,DC=ServiceNowADDomain,DC=com, the relative path is OU=InnerMost,OU=Nested Parent.</td>
</tr>
<tr>
<td>Type</td>
<td>Type of object to create. For example, Group, Computer, or User.</td>
</tr>
</tbody>
</table>
Table 500: Outputs

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in AD occurs.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

**Delete AD Object**

Deletes an object of any type from Active Directory (AD).

Table 501: Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object Name</td>
<td>Name of the object to delete. If the specified object does not exist in AD, the Status output is set to Error.</td>
</tr>
<tr>
<td>Type</td>
<td>Type of object to delete. For example, Group, Computer, or User.</td>
</tr>
</tbody>
</table>

Table 502: Outputs

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in AD occurs.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

**Update AD Object OU**

Changes the Organizational Unit (OU) of an object in Active Directory (AD).

Table 503: Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object Name</td>
<td>Name of the object to change the OU for. If the specified object does not exist in AD, the Status output is set to Error.</td>
</tr>
<tr>
<td>Organizational Unit</td>
<td>New OU to set for the object. Use the Distinguished Name associated with the OU, not the Relative Distinguished Name (RDN). For example, OU=InnerMost,OU=Nested Parent,DC=corp,DC=ServiceNowADDomain,DC=com.</td>
</tr>
</tbody>
</table>

Table 504: Outputs

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in AD occurs.</td>
</tr>
<tr>
<td>Output</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

**Update AD Object Expiration**

Update the account expiration date of an object in Active Directory (AD).

**Table 505: Inputs**

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object Name</td>
<td>Name of the object to update expiration for. If the specified object does not exist in AD, the Status output is set to Error.</td>
</tr>
<tr>
<td>Expiry Date</td>
<td>New expiration date to associate with the user account.</td>
</tr>
</tbody>
</table>

**Table 506: Outputs**

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in AD occurs.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

**Microsoft Azure AD spoke**

Manage users, security groups, and office groups. Apply licenses and provision users in Office 365.

The Azure AD spoke is an available integration through IntegrationHub.

This spoke uses the Azure AD Connection & Credential Alias record. To use these actions, you must create a Connection record and a Credential record and associate them with the Azure AD Connection & Credential Alias record. To learn more about connections and credentials, see *Introduction to credentials, connections, and aliases* on page 1010.

These actions use REST calls, which can run on an instance or MID Server. To determine when to run REST from the instance or a MID Server, see the design considerations in *Integration steps* on page 1357. To learn more about the MID Server, see *MID Server* on page 1579.

**Add Owner To Group**

Adds an owner to an existing group in Azure AD.

**Table 507: Inputs**

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group ID</td>
<td>ID of the group to add an owner to. If the Group ID does not exist in Azure AD, the Status output is set to Error.</td>
</tr>
<tr>
<td>Input</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>User ID</td>
<td>ID of the user to make owner of the group. If the User ID does not exist in Azure AD, the Status output is set to Error.</td>
</tr>
</tbody>
</table>

Table 508: Outputs

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in Azure AD occurs.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

Add User To Group

Adds an existing user to a group in Azure AD.

Table 509: Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group ID</td>
<td>ID of the group to add a user to. If the Group ID does not exist in Azure AD, the Status output is set to Error.</td>
</tr>
<tr>
<td>User ID</td>
<td>ID of the user to add to the group. If the User ID does not exist in Azure AD, the Status output is set to Error.</td>
</tr>
</tbody>
</table>

Table 510: Outputs

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in Azure AD occurs.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

Create Office 365 Group

Creates an Office 365 Group in Azure AD.

Table 511: Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Name</td>
<td>Name to display in the address book for the group.</td>
</tr>
<tr>
<td>Group Email Alias</td>
<td>Alias configured for an email account. A single email account can have more than one alias.</td>
</tr>
<tr>
<td>Email Enable Distribution List</td>
<td>Group email address or distribution list associated with the group. By default set to true.</td>
</tr>
<tr>
<td>Description</td>
<td>Additional information about the group in Azure AD.</td>
</tr>
</tbody>
</table>
Table 512: Outputs

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in Azure AD occurs.</td>
</tr>
<tr>
<td>Group ID</td>
<td>ID of group created in Azure AD. Only populated if Status is Success.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

Create Security Group

Create a Security Group in Azure AD.

Table 513: Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Name</td>
<td>Name to display in the address book for the group.</td>
</tr>
<tr>
<td>Group Email Alias</td>
<td>Alias configured for an email account. A single email account can have more than one alias.</td>
</tr>
<tr>
<td>Description</td>
<td>Additional information about the group in Azure AD.</td>
</tr>
</tbody>
</table>

Table 514: Outputs

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in Azure AD occurs.</td>
</tr>
<tr>
<td>Group ID</td>
<td>ID of group created in Azure AD. Only populated if Status is Success.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

Look Up Group ID

Returns the first Group ID found based on provided search criteria.

Table 515: Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Mail ID</td>
<td>Group email address or distribution list associated with the group.</td>
</tr>
<tr>
<td>Display Name</td>
<td>Name to display in the address book for the group.</td>
</tr>
<tr>
<td>Group Email Alias</td>
<td>Alias configured for an email account. A single email account can have more than one alias.</td>
</tr>
</tbody>
</table>
Table 516: Outputs

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in Azure AD occurs.</td>
</tr>
<tr>
<td>Group ID</td>
<td>First group found with matching criteria in Azure AD.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

**Look Up Group Membership**

Retrieves a list of groups for the given user as a JSON string.

Table 517: Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User ID</td>
<td>ID of the users to retrieve the group for. If the User ID does not exist in Azure AD, the Status output is set to Error.</td>
</tr>
</tbody>
</table>

Table 518: Outputs

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in Azure AD occurs.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
<tr>
<td>Groups List</td>
<td>List of groups in JSON format. For example, [{Group ID1, Group Name1}, {Group ID2, Group Name2}]. If the user is not part of any group, an empty string is returned.</td>
</tr>
<tr>
<td>Number of Groups Found</td>
<td>Total number of groups the user is a member of.</td>
</tr>
</tbody>
</table>

**Remove Owner From Group**

Removes the owner from a group in Azure AD.

Table 519: Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group ID</td>
<td>ID of the group to remove the owner from. If the Group ID does not exist in Azure AD, the Status output is set to Error.</td>
</tr>
<tr>
<td>User ID</td>
<td>ID of the user to remove as owner of the group. If the User ID does not exist in Azure AD, the Status output is set to Error.</td>
</tr>
</tbody>
</table>
### Remove User From Group

Removes an existing user from a group in Azure AD.

**Table 521: Inputs**

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group ID</td>
<td>ID of the group to remove the user from. If the Group ID does not exist in Azure AD, the Status output is set to Error.</td>
</tr>
<tr>
<td>User ID</td>
<td>ID of the user to remove from the group. If the User ID does not exist in Azure AD, the Status output is set to Error.</td>
</tr>
</tbody>
</table>

**Table 522: Outputs**

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in Azure AD occurs.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

### Assign User License

Assigns a license to an existing user in Azure AD and defines access to Office 365 services. For example, if the license includes access to Microsoft Exchange, the user is provisioned a mailbox and login rights.

**Table 523: Inputs**

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User ID</td>
<td>ID of the user to assign a license to. If the User ID does not exist in Azure AD, the Status output is set to Error.</td>
</tr>
<tr>
<td>SKU ID</td>
<td>Licensing plan for your organization using the syntax <code>&lt;CompanyName&gt;:&lt;LicensingPlan&gt;</code>. If the SKU ID does not exist in Azure AD, the Status output is set to Error.</td>
</tr>
</tbody>
</table>

**Table 524: Outputs**

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in Azure AD occurs.</td>
</tr>
<tr>
<td>Output</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

**Remove User License**

Removes a license from a user in Azure AD.

**Table 525: Inputs**

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User ID</td>
<td>ID of the user to remove the license from. If the User ID does not exist in Azure AD, the Status output is set to Error.</td>
</tr>
<tr>
<td>SKU ID</td>
<td>Licensing plan for your organization using the syntax <code>&lt;CompanyName&gt;:&lt;LicensingPlan&gt;</code>. If the SKU ID does not exist in Azure AD, the Status output is set to Error.</td>
</tr>
</tbody>
</table>

**Table 526: Outputs**

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in Azure AD occurs.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

**Delete User**

Deletes a user from Azure AD.

**Table 527: Inputs**

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User ID</td>
<td>ID of the user to delete. If the User ID does not exist in Azure AD, the Status output is set to Error.</td>
</tr>
</tbody>
</table>

**Table 528: Outputs**

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in Azure AD occurs.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

**Disable User**

Disables a user in Azure AD.
### Table 529: Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User ID</td>
<td>ID of the user to disable. If the User ID does not exist in Azure AD, the Status output is set to Error.</td>
</tr>
</tbody>
</table>

### Table 530: Outputs

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in Azure AD occurs.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

### Enable User

Enables a user in Azure AD.

### Table 531: Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User ID</td>
<td>ID of the user to enable. If the User ID does not exist in Azure AD, the Status output is set to Error.</td>
</tr>
</tbody>
</table>

### Table 532: Outputs

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in Azure AD occurs.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

### Look Up User ID

Returns the first User ID found based on the provided search criteria.

### Table 533: Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Name</td>
<td>First name of the user.</td>
</tr>
<tr>
<td>Last Name</td>
<td>Last name of the user.</td>
</tr>
<tr>
<td>Display Name</td>
<td>Name displayed in the address book for the user.</td>
</tr>
<tr>
<td>User Login ID</td>
<td>Login User ID is same as User Principal Name (UPN). For example, <a href="mailto:johndoe@snc.com">johndoe@snc.com</a>.</td>
</tr>
<tr>
<td>Input</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Email Alias</td>
<td>Alias configured for an email account. A single email account can have more than one alias.</td>
</tr>
</tbody>
</table>

**Table 534: Outputs**

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Set to Success if the request succeeds or Error if a failure in Azure AD occurs.</td>
</tr>
<tr>
<td>User ID</td>
<td>First user found with matching criteria in Azure AD.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Reason for the error. Populated only when an error occurs.</td>
</tr>
</tbody>
</table>

**Update User**

Updates user properties in Azure AD with the provided details.

**Note:** Azure AD does not allow updating values to null. Null or empty values are discarded in Azure AD when passed as input.

**Table 535: Inputs**

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Name</td>
<td>Name to display in the address book for the user.</td>
</tr>
<tr>
<td>Email Alias</td>
<td>Alias configured for an email account. A single email account can have more than one alias.</td>
</tr>
<tr>
<td>User Login ID</td>
<td>Login User ID is same as User Principal Name (UPN). For example, <a href="mailto:johndoe@snc.com">johndoe@snc.com</a>. This field is mandatory.</td>
</tr>
<tr>
<td>First Name</td>
<td>First name of the user.</td>
</tr>
<tr>
<td>Last Name</td>
<td>Last name of the user.</td>
</tr>
<tr>
<td>City</td>
<td>City of the user.</td>
</tr>
<tr>
<td>Country</td>
<td>Country of the user.</td>
</tr>
<tr>
<td>Department</td>
<td>Name of the department the user belongs to.</td>
</tr>
<tr>
<td>Mobile</td>
<td>Mobile phone number for the user.</td>
</tr>
<tr>
<td>Job Title</td>
<td>User job title.</td>
</tr>
<tr>
<td>Physical Delivery</td>
<td>Office location of the user.</td>
</tr>
<tr>
<td>Office Name</td>
<td></td>
</tr>
<tr>
<td>Postal Code</td>
<td>Postal code for the user.</td>
</tr>
<tr>
<td>Preferred Language</td>
<td>Preferred language for the user.</td>
</tr>
<tr>
<td>State</td>
<td>State for the user.</td>
</tr>
<tr>
<td>Street Address</td>
<td>Street address for the user.</td>
</tr>
</tbody>
</table>
**Input** | **Description**
---|---
Telephone Number | Telephone number for the user.
Usage Location | Some Microsoft services are not available in all locations. This property must be defined for the user in Azure AD before a license can be assigned to them.

**Table 536: Outputs**

| Output | Description |
---|---|
Status | Set to Success if the request succeeds or Error if a failure in Azure AD occurs. |
Error Message | Reason for the error. Populated only when an error occurs. |

**Microsoft Teams spoke**

The Microsoft Teams spoke provides actions which post messages and ServiceNow incident, problem, and change record details to Microsoft Teams channels.

**Microsoft Teams actions**

The Microsoft Teams spoke is an available integration through IntegrationHub. You can specify the following Microsoft Teams actions within a flow:

**Table 537:**

| Action | Description |
---|---|
Post a Message | Send a message to a Microsoft Teams channel using a Webhook Connector. Specify the Webhook URL, Title, and Message to send. |
Post Change Details | Send details about a ServiceNow change record to a Microsoft Teams channel using a Webhook Connector. Specify the Webhook URL and Change record to send. |
Post Incident Details | Send details about a ServiceNow incident record to a Microsoft Teams channel using a Webhook Connector. Specify the Webhook URL and Incident record to send. |
Post Problem Details | Send details about a ServiceNow problem record to a Microsoft Teams channel using a Webhook Connector. Specify the Webhook URL and Problem record to send. |

**Microsoft Teams Inputs**

The following inputs are common to the Microsoft Teams actions:
**Table 538:**

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>[Required] Webhook URL</strong></td>
<td>The Microsoft Teams webhook for sending a message. Set up the webhook before configuring this action. Refer to the custom incoming webhook for Microsoft Teams documentation.</td>
</tr>
<tr>
<td><strong>[Optional] Title</strong></td>
<td>Title of the message.</td>
</tr>
<tr>
<td><strong>[Optional] Additional Message</strong></td>
<td>Add a message before the record details.</td>
</tr>
<tr>
<td><strong>[Optional] Override Default Fields</strong></td>
<td>You can provide a comma-separated list of field names to send instead of the default fields. Default fields are Short Description, Category, State, Priority, and Assignment Group.</td>
</tr>
<tr>
<td><strong>[Optional] Theme Color (Hex)</strong></td>
<td>Hex code value of color to highlight the message.</td>
</tr>
</tbody>
</table>

**Example**

You can add a Microsoft Teams Post Incident Details action to a flow which identifies newly created high priority incidents and a specified theme color.

![Flow diagram](image)

**ServiceNow eBonding spoke**

The ServiceNow eBonding spoke demonstrates some common integration design patterns through a common use case of synchronizing incidents across ServiceNow instances.
Base system eBonding actions

If you have multiple production instances in your environment, you might have a need to synchronize data across these instances. For example, one instance might manage internal applications (your source system) and another manages external customer facing applications (your target system). A common use case is an incident which initially opens on the source system, but it requires a correlated incident to be created and tracked on the target instance. The ServiceNow eBonding integration contains the following OOB actions to assist in creating the synchronization:

**Create Remote Incident action**

This action uses the source system incident details to create a new incident on the target instance. It passes the source incident number as the Correlation ID on the target system. It takes the target system incident number and updates the Correlation ID of the source system.

**Lookup Remote Incident action**

This action takes the remote incident number as input and retrieves more details about that incident, such as: short description, description, priority, etc.

**Update Remote Incident action**

This action uses the source incident details to update the remote incident with details from source instance. Look up of remote incident is performed using Correlation ID in source instance’s incident.

Credential and Connection information for eBonding

When building actions, you must decouple the connection and credential information from the action so there is a seamless transition from distinct production environments. This also makes it easier to share content and create content through the ServiceNow store.

As part of eBonding example, you can associate an OOB connection alias (sn_ebonding_ah.ServiceNow). Create an HTTP connection record and associate it with this alias. For credentials, ServiceNow web services supports a multitude of authentication mechanisms. Create a BasicAuth credential to start with, however, that login ID must have permissions to create, read, and update an incident on your remote system. An example HTTP connection:
Additional eBonding Script

The Payloadbuilder script is included with this example. It builds a payload by reading a set of fields from an incident table used in the REST steps for these actions.

Slack spoke

The Slack spoke provides actions which post messages and ServiceNow incident, problem, and change record details to Slack channels.

Slack actions

The Slack spoke is an available integration through IntegrationHub. You can specify the following Slack actions within a flow:

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post a Message</td>
<td>Send a message to a Slack channel using an Incoming Webhook. Specify the Webhook URL and Message to send.</td>
</tr>
<tr>
<td>Post Change Details</td>
<td>Send details about a ServiceNow change record to a Slack channel using a Webhook Connector. Specify the Webhook URL and Change record to send.</td>
</tr>
<tr>
<td>Post Incident Details</td>
<td>Send details about a ServiceNow incident record to a Slack channel using a Webhook Connector. Specify the Webhook URL and Incident record to send.</td>
</tr>
<tr>
<td>Post Problem Details</td>
<td>Send details about a ServiceNow problem record to a Slack channel using a Webhook Connector. Specify the Webhook URL and Problem record to send.</td>
</tr>
</tbody>
</table>

Slack Inputs

The following inputs are common to the Slack actions:

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Required] Webhook URL</td>
<td>The Slack webhook for sending a message. Set up the webhook before configuring this action. Refer to the custom incoming webhook for Slack documentation.</td>
</tr>
<tr>
<td>[Optional] Additional Message</td>
<td>Add a message before the record details.</td>
</tr>
<tr>
<td>Input</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>[Optional] Channel</td>
<td>Specify the Slack channel to post information.</td>
</tr>
<tr>
<td>Username</td>
<td>Specify a username to include in your post.</td>
</tr>
<tr>
<td>[Optional] Override Default Field</td>
<td>You can provide a comma-separated list of field names to send instead of the default fields. Default fields are Short Description, Category, State, Priority, and Assignment Group.</td>
</tr>
<tr>
<td>[Optional] Icon</td>
<td>Add an icon to the communication.</td>
</tr>
</tbody>
</table>

**Note:** If you do not specify a Username, Channel, or Icon, it will post the message using the defaults as configured in your webhook. If you specify them here, they will override those defaults.

**Example**

You can add a Slack Post Incident Details action to a flow which identifies newly created high priority incidents, a username, and a specific slack channel.
Integration steps

Enable custom actions to integrate with external systems by activating IntegrationHub, which adds integration steps to the Action Designer interface.

Integration steps can run on the instance or a MID Server. A MID Server is required to communicate with or move data between a ServiceNow instance and external applications, data sources, and services in your network.

Steps that perform operations on record data run on the instance, while steps that integrate with systems in your network run on a MID Server. If a step requires a MID Server to run, the instance delegates flow processing to the appropriate MID Server by sending the process plan in a REST call. The MID Server executes the action or step in the process plan and returns results. View log messages and execution status from the instance or the MID Server.
Available integration steps

These integration steps are available from *Action Designer* on page 1283.

<table>
<thead>
<tr>
<th>Integration step</th>
<th>Description</th>
<th>Step runs from</th>
</tr>
</thead>
<tbody>
<tr>
<td>REST step on page 1301</td>
<td>Send an outbound REST web service request to an external system.</td>
<td>• Instance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• MID Server</td>
</tr>
<tr>
<td>PowerShell step on page 1296</td>
<td>Run PowerShell scripts on remote machines from your ServiceNow instance through a MID Server.</td>
<td>MID Server</td>
</tr>
</tbody>
</table>

Connection attributes

Define connection-specific variables that you can use in IntegrationHub integration steps. When using an integration step, you must establish a connection with an external system. Use a Connection & Credential alias instead of defining the connection inline. An alias enables you to update the connection details once without having to reconfigure every action. Any action step that uses an alias inherits the attributes associated with it. Flow Designer displays attributes as data pills that you can drag into your action step. For example, you can create a page size attribute that becomes a REST step query parameter. For more information about connection attributes, see *Create connection attributes* on page 1013.

MID Server connection aliases

Action designers can set MID Server selection attributes using a connection record associated with an alias and associate the alias with an integration step. When the flow runs, the system uses the attributes to determine which MID Server runs the step. Learn more about connection and credential aliases.

MID Server selection

Flow designers should avoid shifting the execution environment between MID Servers when a flow runs. Either configure your MID Servers to perform operations on multiple endpoints, or provide multiple capabilities to the MID Servers in your network. You may need a user with the connection_admin role to update the connection records associated with an action, or a network administrator to update the MID Server network configuration. To learn more about how a MID Server is selected during runtime, see *MID Server selection* on page 1630.

Design considerations

Design integration steps using the following guidelines.

- Avoid shifting the execution environment between the instance and the MID Server multiple times. Where possible, group similar action steps. For example, group core steps that perform record operations and integration steps that run on the MID Server.
- When creating a spoke that uses an integration step, include a Connection and Credential alias record with the appropriate connection type. Before anyone can use the spoke, a user with the connection_admin role must associate the alias record to a connection record that supports the
connection type. If defining the connection inline, use inputs to enable the process analyst to define the connection information when adding the action to a flow.

- The MID Server does not have access to all the values in a GlideRecord object, it only has access to the sys_id reference. Inputs of type Reference do not work on a MID Server. Instead, create action inputs that contain the necessary GlideRecord values.

**Roles**

To create integration steps, a user must have the action_designer or admin roles.

**REST step**

Send an outbound REST web service request to an external system.

**Note:** REST step is not available on the base system and requires a separate IntegrationHub subscription. After the IntegrationHub plugin is activated, the step is visible under Integrations.

*Outbound REST web service* is a platform feature that allows you to retrieve, create, update, or delete data on a web services server that supports the REST architecture.

**Roles and availability**

- Available as an Action Designer action step. Subject matter experts use the action_designer role to create a custom action with one or more action steps.

**Fields**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection</td>
<td>The type of connection to use.</td>
</tr>
<tr>
<td></td>
<td>- Define Connection Inline: Define connection information within the action step.</td>
</tr>
<tr>
<td></td>
<td>- Use Connection Alias: Define connection information using the Connection Alias table. Using an alias eliminates the need to configure multiple credentials and connection information profiles when using an action in multiple environments. Likewise, if the connection information changes, you do not have to update your custom action.</td>
</tr>
</tbody>
</table>

To learn more about connections and credentials, see [credentials, connections, and aliases](#).
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection Alias</td>
<td>Specify the Connection &amp; Credential alias record the system uses to run the action step. Requires a flow designer or admin to create or select an associated Connection record. Using an alias eliminates the need to configure multiple credentials and connection information profiles when using an action in multiple environments. Likewise, if the connection information changes, you do not have to update your custom action. To learn more about connections and credentials, see credentials, connections, and aliases. &lt;br&gt;&lt;br&gt;<strong>Note:</strong> This field is only visible when the Connection is Use Connection Alias.</td>
</tr>
<tr>
<td>Credential Alias</td>
<td>Specify the credential alias the system uses to run the action step. Requires a flow designer or admin to create or select an associated Credential record. Using an alias eliminates the need to configure multiple credentials when using an action in multiple environments. Likewise, if the credential information changes, you do not have to update your custom action. To learn more about connections and credentials, see credentials, connections, and aliases. &lt;br&gt;&lt;br&gt;<strong>Note:</strong> This field is only visible when the Connection is Define Connection Inline.</td>
</tr>
<tr>
<td>Use MID</td>
<td>The option to use a MID Server to run the REST step. Select this option to display the MID Application and Capabilities fields.</td>
</tr>
<tr>
<td>Base URL</td>
<td>The base URL for the REST request. If Use Connection Alias is selected, this field is read-only and displays the base URL associated with alias. If Define Connection Inline is selected, enter a base URL for the connection.</td>
</tr>
<tr>
<td>MID Application</td>
<td>Specify the capabilities the MID Server must support to be eligible for selection. The system runs the action step from a MID Server that supports the selected capabilities. &lt;br&gt;&lt;br&gt;<strong>Note:</strong> This field is only visible when Use MID is enabled.</td>
</tr>
<tr>
<td>Capabilities</td>
<td>Specify the capabilities the MID Server must support to be eligible for selection. The system runs the action step from a MID Server that supports the selected capabilities.                                                                               &lt;br&gt;&lt;br&gt;<strong>Note:</strong> This field is only visible when Use MID is enabled.</td>
</tr>
<tr>
<td>Resource Path</td>
<td>Specify the path for the resource.</td>
</tr>
<tr>
<td>HTTP Method</td>
<td>Specify the HTTP method to process the request. &lt;br&gt;• GET  &lt;br&gt;• POST &lt;br&gt;• PUT  &lt;br&gt;• PATCH  &lt;br&gt;• DELETE</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Query Parameters</td>
<td>Specify the name-value pairs to pass to the REST endpoint. You can create these parameters manually, or drag input variables into the parameter fields, and then assign a value.</td>
</tr>
<tr>
<td>Headers</td>
<td>Specify the headers to send with the request. You can create headers manually, or drag input variables into the parameter fields, and then assign a value.</td>
</tr>
</tbody>
</table>
| Request Type          | Specify the format of the request. Options include.  
• Text: A request in JSON, XML, or other text format.  
• Binary: A request in a binary file format.  
• Multipart: A request consisting of multiple content types.  
• Form URL-Encoded: A request in a URL-encoded query.  

**Note:** This field is only editable when the HTTP Method is POST, PUT, PATCH, or DELETE.  

| Request Body [Text]   | Enter the body of the request in JSON or XML format. The flow execution details display the response body as either a link to the embedded text viewer or the Sys ID of the attachment record containing the response.  

**Note:** This field is only editable when the Request Type is Text. |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Attachment</td>
<td>Specify the Attachment record containing the request. You can look up this record in a prior step or define it as an input variable.</td>
</tr>
</tbody>
</table>
| Name, Type, Value     | Specify the content of a multiple part request. For each request part, specify its name, content type, and value. The name can be any valid string and the type can be any valid type. The value must match the content type.  
For attachments, specify:  
• Type: attachment  
• Value: The Sys ID of the Attachment record containing the content. You can look up this record in a prior step or define it as an input variable.  

**Note:** These fields are only visible when the Request Type is Binary.  

**Note:** These fields are only visible when the Request Type is Multipart. |
| Name, Value           | Specify the content of a form URL-encoded request. Specify each part of the URL-encoded request with a name-value pair.  

**Note:** These fields are only visible when the Request Type is Form URL-Encoded. |
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Save As Attachment</td>
<td>Specify whether to save the response as a record in the Attachment [sys_attachment] table.</td>
</tr>
<tr>
<td>Attachment File Name</td>
<td>Specify the name of the attachment created by the REST response. For example, rest-response.txt.</td>
</tr>
<tr>
<td>Note:</td>
<td>This field is only visible when Save Response As Attachment is enabled.</td>
</tr>
<tr>
<td>Attachment File Record</td>
<td>Specify the target record to which the attachment is associated. Must be a data pill of type Record. For example, a specific incident record. You can look up this record in a prior step or define it as an input variable. The flow execution details display the Sys ID of the associated record.</td>
</tr>
<tr>
<td>Note:</td>
<td>This field is only visible when Save Response As Attachment is enabled.</td>
</tr>
</tbody>
</table>

**REST Response**

By default, the system limits the size of REST responses that are not saved as attachments to 5 MB. Direct REST responses that exceed this limit generate an error. To support larger response sizes, either save the response as an attachment or increase the response size limit with the glide.pf.rest.response_payload_max_size system property. This system property supports a maximum value of 10 MB.

**PowerShell step**

Run PowerShell scripts on remote machines from your ServiceNow instance through a MID Server.

PowerShell is built on the Windows .NET Framework and is designed to control and automate the administration of Windows machines and applications. ServiceNow supports PowerShell 2.0 and above. PowerShell 3.0 does not support Windows 2003 Server.

**Note:** PowerShell step is not available on the base system and requires a separate IntegrationHub subscription. After the IntegrationHub plugin is activated, the step is visible under Integrations.

**Roles and availability**

- Available as an Action Designer action step. Subject matter experts use the action_designer role to create a custom action with one or more action steps.
### Fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Connection** | Type of connection to use.  
  - Define Connection Inline: Define connection information within the action step.  
  - Use Connection Alias: Define connection information using the Connection Alias table. Using an alias eliminates the need to configure multiple credentials and connection information profiles when using an action in multiple environments. Likewise, if the connection information changes, you do not have to update your custom action.  
  To learn more about connections and credentials, see credentials, connections, and aliases. |
| **Connection Alias** | Specify the Connection & Credential alias record the system uses to run the action step. Requires a flow designer or admin to create or select an associated Connection record. Using an alias eliminates the need to configure multiple credentials and connection information profiles when using an action in multiple environments. Likewise, if the connection information changes, you do not have to update your custom action.  
  To learn more about connections and credentials, see credentials, connections, and aliases.  
  **Note:** This field is only visible when the Connection is Use Connection Alias. |
| **Credential Alias** | Specify the credential alias the system uses to run the action step. Requires a flow designer or admin to create or select an associated Credential record. Using an alias eliminates the need to configure multiple credentials when using an action in multiple environments. Likewise, if the credential information changes, you do not have to update your custom action.  
  To learn more about connections and credentials, see credentials, connections, and aliases.  
  **Note:** This field is only visible when the Connection is Define Connection Inline. |
| **Host**       | Specify the fully-qualified domain name of the target host where the system runs the action step. For example, host.domain.com.  
  **Note:** This field is only visible when the Connection is Define Connection Inline. |
| **Port**       | Specify the communications port on which the target host listens for connections. For example, 5985. Leave blank to use the default port.  
  **Note:** This field is only visible when the Connection is Define Connection Inline. |
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MID Application</td>
<td>Specify the application the MID Server must support to be eligible for selection. The system runs the action step from a MID Server that supports the selected application.</td>
</tr>
<tr>
<td>Capabilities</td>
<td>Specify the capabilities the MID Server must support to be eligible for selection. The system runs the action step from a MID Server that supports the selected capabilities.</td>
</tr>
<tr>
<td>Remoting Type</td>
<td>The location where the PowerShell script runs such as the MID or a remote server.</td>
</tr>
<tr>
<td></td>
<td>• Explicit Remoting (Most Common): Establish a connection with and run the script on a remote server.</td>
</tr>
<tr>
<td></td>
<td>• Implicit Remoting (Advanced): Run a script on a MID Server while importing necessary modules from a remote server. If selected, define the Remote name prefix and Modules to import fields. For optimal performance, only import modules necessary to the step. If blank, all available modules are imported from the server.</td>
</tr>
<tr>
<td></td>
<td>• Run on a MID Server or have your script establish a remote session: Run a script directly on a MID Server, or define remoting specifications within the script. This value is the default.</td>
</tr>
<tr>
<td>Remote name prefix</td>
<td>The file path, excluding file names, to the modules to load from the remote server.</td>
</tr>
<tr>
<td>Modules to import</td>
<td>The comma-separated list of modules to import from the remote server at the defined file path.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Script type</td>
<td>The type of script to run on the PowerShell host.</td>
</tr>
<tr>
<td></td>
<td>• Inline script: Enter the script to run in the Command field of the step.</td>
</tr>
<tr>
<td></td>
<td>• MID Server Script File: Select the PowerShell script to run from the MID Server Script Files [ecc_agent_script_file] table. This is the</td>
</tr>
<tr>
<td></td>
<td>default value and separates scripting logic from the action, enabling you to update the script without having to modify and redeploy the</td>
</tr>
<tr>
<td></td>
<td>action.</td>
</tr>
<tr>
<td>MID Server Script</td>
<td>Pre-defined PowerShell script from the MID Server Script Files table [ecc_agent_script_file].</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This field is only available if the Script type is MID Server Script File.</td>
</tr>
<tr>
<td>Script path</td>
<td>Read-only path to the selected MID Server script.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This field is only visible when the Script type is MID Server Script File.</td>
</tr>
<tr>
<td>Input variables</td>
<td>The optional name-value pairs that represent the values of PowerShell script variables. You can use action inputs and data from other steps</td>
</tr>
<tr>
<td></td>
<td>within the PowerShell script. Define the following fields for each variable:</td>
</tr>
<tr>
<td></td>
<td>• Name: The name of the script variable to pass a value to. The name cannot match a reserved or prohibited PowerShell variable. Some variable</td>
</tr>
<tr>
<td></td>
<td>names are reserved for internal processing and should not be used as input variables. See Reserved variables in PowerShell scripting variables.</td>
</tr>
<tr>
<td></td>
<td>• Type: The type of PowerShell variable. Select plain text, encrypted, or boolean. If encrypted is selected, the value appears in plain text in</td>
</tr>
<tr>
<td></td>
<td>this field and is only encrypted when it passes to the ECC Queue.</td>
</tr>
<tr>
<td></td>
<td>• Value: The value to map to the variable. Manually enter a value, or drag a data pill into the field.</td>
</tr>
<tr>
<td>Command</td>
<td>The inline PowerShell script to run on the target host.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This field is only visible when the Script type is Inline script.</td>
</tr>
</tbody>
</table>

**PowerShell scripting variables**

To access input variables from the Command field, you must call them using special syntax. The syntax you use depends on the value of a system property. If the Remoting Type is Run on a MID Server or have your script establish a remote session, some reserved variables are available in addition to input variables.

**Input variable syntax**

By default, prefix variable names with a $ character. For example, if an input variable is named message, use $message to access the variable in script.
If the `mid.powershell.command.script.parameter_passing` parameter is set to false, prefix the variable name with `env:SNC_`. For example, if an input variable is named `message`, use `env:SNC_message` to access the variable in script. To learn more about the `mid.powershell.command.script.parameter_passing` parameter, see *MID Server parameters* on page 1648.

### Reserved variables

When the Remoting Type is Run on a MID Server or have your script establish a remote session, the following variables are available for use in script. Reserved variables cannot be used as custom input variable names.

<table>
<thead>
<tr>
<th>Reserved variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>$computer</code></td>
<td>Host IP address defined in the Connection alias record.</td>
</tr>
<tr>
<td><code>$cred</code></td>
<td>Credential object that contains the credentials defined in the connection record. Use this variable with any PowerShell cmdlet that supports the credential parameter. For example, <code>New-PSSession -credential $cred</code>.</td>
</tr>
<tr>
<td><code>$log_info</code></td>
<td>If the <code>mid.property.powershell.log_info</code> property is set to true, adds logging information to a PowerShell script.</td>
</tr>
</tbody>
</table>

The following variable names are reserved for internal processing and should not be used as input variables.

- script
- useCred
- isMid
- isDiscovery
- debug
- user
- password
- executingScriptDirectory
- midScriptDirectory
- hresult
Interaction Management

Interactions are a centralized location for all communication channels in the platform. Each interaction represents a request for assistance through a given channel, for example, a call or a chat. Use interactions to route to queues for assignment or assign them to agents directly. Associate related records with an interaction to track additional work being done as a result of the interaction.

The platform offers several forms of queuing and communication management, but each system is tightly coupled to the specific area. Interactions offer an alternative, flexible, and more extensible option so that each product area can use the same framework.

Interactions are categorized into interaction queues, which determine how each interaction is assigned. Queues also contain configuration information such as the schedule for the queue, automated responses, and average wait time. Users are assigned interactions if they are members of the assignment group associated with the interaction queue.

Activate the interaction management system

An administrator can activate the Interaction Logging, Routing, and Queueing plugin [com.glide.interaction] to access the functionality.

Interactions

Role required: admin

1. Navigate to System Definition Plugins.
3. Review the plugin details then click the Activate/Repair related link.
4. In the activate plugin window, click Activate.

The interaction plugin includes the following roles.

Components installed with Interaction Management

Several types of components are installed with activation of the Interaction Logging, Routing, and Queueing plugin, including tables and user roles.

Note: To view all other components installed with this plugin, see the Application Files table. For instructions, see Find components installed with an application.

Roles installed

<table>
<thead>
<tr>
<th>Role title [name]</th>
<th>Description</th>
<th>Contains roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interaction Administrator</td>
<td>Configure interactions for users.</td>
<td>• interaction_agent</td>
</tr>
<tr>
<td>[interaction_admin]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interaction Agent</td>
<td>Create and edit interactions. Transfer interactions to different agents or queues.</td>
<td></td>
</tr>
<tr>
<td>[interaction_agent]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Tables installed

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interaction [interaction]</td>
<td>Table for all interaction records.</td>
</tr>
<tr>
<td>Interaction Queue [interaction_queue]</td>
<td>List of available queues that an interaction can be associated with.</td>
</tr>
<tr>
<td>Interaction Connector [interaction_connector]</td>
<td>List of connectors or channels that an interaction can be assigned to.</td>
</tr>
<tr>
<td>Interaction Agent Status [interaction_agent_status]</td>
<td>Status of all agents assigned to a queue. The status options included available, away, or offline.</td>
</tr>
<tr>
<td>Interaction Agent Transfer [interaction_agent_transfer]</td>
<td>List of interactions that are in the process of being transferred from one agent to another.</td>
</tr>
<tr>
<td>Interaction Queue Transfer [interaction_queue_transfer]</td>
<td>List of interactions that are in the process of being transferred from one queue to another.</td>
</tr>
<tr>
<td>Interaction JSON blob [interaction_json_blob]</td>
<td>List of records that store context information for each interaction.</td>
</tr>
<tr>
<td>Interaction related record [interaction_related_record]</td>
<td>List of related records that have been associated with an interaction.</td>
</tr>
</tbody>
</table>

### Interaction configuration overview

Configure the behavior of an interaction by determining the routine behavior for each state that the interaction goes through during the life cycle.

### Interaction framework

Configure each of the following interaction components to determine the behavior and life cycle.

- Lists: Configure the interaction list view. You can also extend the interaction table.
- Forms: Configure the form view to tailor interactions for each application.
- UI actions: Advance the interaction through the interaction life cycle. You can also amend supplied interaction behavior, like creating a case or attaching a file, by copying an existing base system UI action and making changes.
- Connectors: Tap in to the interaction life cycle. Determine the routine behavior for an interaction at each point in the life cycle. Define the channel where communication takes place, for example, chat or phone.
- Queues: Determine how interactions get routed.
Interaction states

States determine the behavior for interactions. For each state of the interaction life cycle, you determine which routine actions to perform. For example, the On Created state would have a script that creates an interaction and then adds the end user as the ‘opened for’. The script then sends a message to the end user to let them know that the interaction has been opened.

Interactions advance through the state life cycle using UI actions. Business rules transition interactions from state to state. Business rules also evaluate routing and assignment rules.

Table 541: States

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
<th>Connector Hook</th>
</tr>
</thead>
<tbody>
<tr>
<td>New</td>
<td>An interaction is inserted into the interaction table</td>
<td>On Created</td>
</tr>
<tr>
<td>Queued</td>
<td>The Queue field is filled or changed on a record that was in a New state</td>
<td>On Queued</td>
</tr>
<tr>
<td>Waiting For Agent</td>
<td>The interaction is in an auto-assignment queue that has no agents with available capacity.</td>
<td>N/A</td>
</tr>
<tr>
<td>Pending Accept</td>
<td>A receiving agent has been identified, but the agent has not yet accepted the interaction.</td>
<td>N/A</td>
</tr>
<tr>
<td>Work In Progress</td>
<td>An agent accepts an unassigned interaction</td>
<td>On Assigned</td>
</tr>
<tr>
<td>Closed Complete</td>
<td>The agent or consumer intentionally closes the interaction</td>
<td>On Closed</td>
</tr>
<tr>
<td>Closed Abandoned</td>
<td>The interaction is closed because the consumer disconnects or is unresponsive</td>
<td>On Abandoned</td>
</tr>
<tr>
<td>Error</td>
<td>Something unexpected happened that IMS could not recover from</td>
<td>On Error</td>
</tr>
</tbody>
</table>
Configure interaction queues

Interaction queues define a category that interactions can be grouped for assignment. Queues also define the default messages, schedule and escalation path.

Role required: interaction_admin

1. Navigate to Interaction Queues.
2. Click New or open an existing queue from the list.
3. Complete following fields in the Interaction Queue form as needed.

Table 542: Interaction Queue form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the queue.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Active</td>
<td>Whether the queue is active</td>
</tr>
<tr>
<td>Assignment group</td>
<td>User group that contains the support staff for the queue. Any user in the group can view the queue in the chat window and accept chats. No other users can access the queue. This field must be populated.</td>
</tr>
<tr>
<td>Average wait time</td>
<td>Average time it takes for an agent to accept a chat in the queue. This value is automatically calculated. Do not manually edit.</td>
</tr>
<tr>
<td>Confirm problem</td>
<td>Message that users see to acknowledge that their chat was submitted.</td>
</tr>
<tr>
<td>Escalate to</td>
<td>Different queue to which an agent can escalate a chat. For example, there is a queue for high priority support chats. When a queue is defined in this field, agents can access the Escalate option in conversations.</td>
</tr>
<tr>
<td>Initial agent response</td>
<td>Message that users see when an agent accepts their chat. For example, Thank you for contacting support. We are looking into your question now and will be with you shortly.</td>
</tr>
<tr>
<td>Not available</td>
<td>Message that users see when they attempt to start a chat outside the defined queue Schedule. You can use HTML to format the message and include links or media.</td>
</tr>
<tr>
<td>Question</td>
<td>Initial phrase that users see when they start a new chat in the queue. For example, How can I help you?</td>
</tr>
<tr>
<td>Queued interactions</td>
<td>The number of unopened interactions waiting in the queue. This value is automatically calculated. Do not manually edit. If you want to limit the duration to just an hour, minute, or second field, add the dictionary attribute max_unit=&lt;unit&gt;. For more information on limiting the duration by a unit of measure, see .</td>
</tr>
<tr>
<td>Schedule</td>
<td>Schedule that defines when the queue is available. Leave the field blank to make the queue available all the time. Users cannot start a new conversation in the queue outside the schedule hours.</td>
</tr>
</tbody>
</table>

4. Click Submit.
Configure interaction connectors

Connectors provide a framework for connecting an interaction to a communication channel. Configure how an interaction behaves depending on the channel it is associated with using interaction connectors.

Connector hooks are included to help define the interaction lifecycle. You can declare what should happen at each point during the interaction lifecycle using these hooks.

Role required: interaction_admin

1. Navigate to Interaction Configuration Connectors.
2. Click New or open an existing connector to change the configuration.
3. In the Name field, type the name of the connector. Name the connector by channel type, for example, Chat or Phone.
4. In the Description field, type a description for the connector.
5. For each of the following connector hooks for the interaction life cycle, write a script to determine how the interaction behaves. Use the GlideRecord API or the Connect API to configure the script.
   - On assigned
   - On close
   - On created
   - On queued
   - On transferred
   - On abandoned

For each state of the interaction life cycle, you can create a script to perform routine actions. For example, the on created state would have a script that creates an interaction, adds the end user as the opened for, and sends a messages to the end user to let them know that the interaction has been opened.

Interaction routing

Use matching rules to identify interactions that meet certain conditions.

You can dynamically add an interaction to a queue by assigning to manually, or you can set up matching rules to determine how an interaction should be routed. Extend or replace to the default routing rules to tailor the routing behavior for different applications or requirements.

The Run Queue Matching Rule business rule kicks On Queued matching for any interactions that are created without a queue. Routing can be bypassed if a queue is specified at creation time, if the interaction is assigned to a fulfiller at creation time, or if the interaction is created with a state beyond Queued.

Create one or more matching rules that establish specific conditions that an interaction must meet before it can be routed to an agent. Then use an assignment rule to route those cases to agents based on product knowledge and availability. You can also invoke the MarchingRuleProcessor API to execute the matching rules and return a list of users (sys_ids).

Matching rules are based on two defined sets of conditions, one that identifies specific case attributes and another that identifies the agent resources best suited to handle cases with these attributes. Matching rules are created using the Matching Rule form.

For more information on creating matching rules for interactions, see Create a matching rule.

Interaction context and channel metadata

Context and channel metadata are document ID fields included as part of interactions. Both types of records store information about the interaction.
Context

Context for an interaction tracks the information for an interaction, such as the initial question, asset tagging, or device location. Context records are stored on the interaction_json_blob table by default, however you can use any table to store a context record.

Channel metadata

Channel metadata contains the information needed to interact with the channel on which communication is happening on, for example, the chat or phone channels. Channel metadata can be free-form JSON or a reference to another record.

Configure close interaction schedule

Interactions that are work in progress for longer than seven days are automatically moved to Closed Abandoned. Use the glide.interaction.auto_close.age to configure the length of time interactions can be in a work in progress state.

Use the following property to make sure any orphaned interactions are closed after a period of time.
Role required: admin
1. In the navigation filter, type sys_properties.list.
2. Search for the glide.interaction.auto_close.age system property.
3. In the value field, change the value to the number in days an interaction can be in the work in progress state before being moved to closed abandoned.

Create an interaction

Most interaction creation takes place in other applications, interactions are merely a method of controlling channels. However, if needed you can create an interaction from the Interaction application.
Role required: interaction_agent
1. Navigate to Interaction All.
2. Click New.
3. In the Channel field, enter the way the interaction began. For example, chat, phone, or walk-up.
4. In the Opened for field, type the name of the user starting the interaction.
5. In the Queue field, enter the name of the queue that most suits the user's query.
6. Include any additional information in the short description and the work notes fields.

View any incidents opened by the same user by clicking the Use the Incidents by Same Caller related list.

Transfer an interaction

Transferring an interaction mostly occurs in other applications, however you can use the Interaction application to transfer an interaction to a queue or to another agent.
To transfer an interaction to another agent, the interaction needs to be assigned to you.
Role required: interaction_agent
1. Navigate to Interaction Assigned to Me.
2. Open an interaction you want to transfer.
3. In the interaction header, click Transfer to Agent or Transfer to Queue.

Transferring an interaction to another queue creates a new interaction for that queue and closes out the existing interaction. When you transfer an interaction to another agent, the agent must accept the interaction before the transaction can be completed.

**Associate a record with an interaction**

As an agent, you might need to create a record on another table to work on an interaction. You can associate the record with the interaction.

Role required: interaction_agent

1. Navigate to Interaction Assigned to me.
2. Open the interaction you want to associate with another record.
3. In the form header, click Associate Record.
4. In the ID of related record field, click the search icon.
5. From the Document Table list, select the table you want to associate a record from.
6. From the Document field, click the search icon.
7. Select an existing record from the list, or click New to create a record.
8. Click OK.
9. Click Submit.

The associated record appears in the Related Tasks related list for the interaction.

**Knowledge Management**

The ServiceNow® Knowledge Management (KM) application enables the sharing of information in knowledge bases. These knowledge bases contain articles that provide users with information such as self-help, troubleshooting, and task resolution.

Knowledge Management has significantly changed with Knowledge v3, which is enabled by default for all instances starting with the Fuji release.

Knowledge Management supports processes for creating, categorizing, reviewing, and approving articles. Users can search and browse articles as well as provide feedback.

To support multiple groups, knowledge bases can be assigned to individual managers. Separate workflows can be used for publishing and retiring articles, and separate access controls can be used to control reading and contributing.

**Explore**

- Knowledge Management release notes
- Upgrade to London
- Knowledge Management v3
- Knowledge homepage on page 1380
- Knowledge search on page 1382
- Contextual search
- Social Q&A on page 1388

**Set up**

- Video: Getting Started with Knowledge Management v3
- Knowledge Management setup guide for admins on page 1375
- Knowledge base setup guide for knowledge admins and managers on page 1377

**Administer**

- Select user criteria for a knowledge base
- Video: How to Control Knowledge Access Through User Criteria
- Blog: Article Security and Filtering in Knowledge v3
- Define a knowledge article category on page 1410

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Knowledge Management setup guide for admins

Before users in your organization can start creating knowledge bases and knowledge articles, you must set up Knowledge Management. Work with stakeholders to define requirements for setting up Knowledge Management effectively to meet the needs of users. For this task, you must be an administrator with the admin role.

Requirements

Role required
admin

Before you begin

Meet with the following stakeholders

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge manager</td>
<td>Defines and oversees the knowledge management processes for day-to-day operations related to content publishing and usage.</td>
</tr>
<tr>
<td>Knowledge admin</td>
<td>Configures advanced settings for specific Knowledge Management features</td>
</tr>
</tbody>
</table>
With stakeholders, determine the following requirements

- Who are the consumers of the content in the knowledge bases?
- Who are the writers, editors, and managers for the knowledge base articles?
- What are the required workflows to publish and retire articles?
- What are the unique behaviors required for your knowledge management implementation? For example, should attachments appear in search results?
- Do knowledge articles need to be translated into other languages?

What to do

Assign knowledge roles to users and groups
Determine which Knowledge Management roles on page 1379 are appropriate for each user, and then assign those roles.

Create custom Knowledge workflows
If the default knowledge workflows for publishing and retiring knowledge articles are not appropriate for knowledge bases, create custom workflows for those knowledge bases.

Configure Knowledge properties
If the default knowledge properties do not fulfill the requirements of users, reconfigure the properties as necessary.
Activate support for other languages besides English

If languages other than English must be supported, activate the Knowledge Management Internationalization plugins.

Coordinate with knowledge managers for knowledge base setup

Let knowledge managers and administrators know that they can start configuring their knowledge bases. For details, refer them to the Knowledge base setup guide for knowledge admins and managers on page 1377.

Next steps

Depending on any other requirements for the knowledge bases, you may be asked to help with additional tasks, such as configuring knowledge homepages.

Knowledge base setup guide for knowledge admins and managers

After basic Knowledge Management setup is completed, you can set up a knowledge base for users to create and publish knowledge articles.

Multiple knowledge bases can be created for different groups within your organization to share information within and between those groups.

Administrators create knowledge bases, and assign them to individual managers responsible for controlling the behavior and organization scheme of each knowledge base.

Each knowledge base contains knowledge articles that provide information for users, such as policy, release notes, or instructions for a task. Each knowledge base can also use a separate workflow for publishing and retiring articles.

Requirements

Role required

knowledge_administrator, knowledge_manager, or admin

Before you begin

Determine the following requirements for each knowledge base that you want to set up:

- Who are the knowledge base managers that are responsible for approving articles?
- Who are the users and contributors for that knowledge base? Access for these users is defined through user criteria.
- What are the categories to be used to classify articles? Will users be able to create categories?
- Will users of the knowledge base be able to create new content?
- Will Social Q&A be leveraged for this knowledge base?
What to do

Set up the knowledge base

1. Create the knowledge base.
2. Set up which users can read, create, or edit knowledge articles by selecting user criteria for the knowledge base.
3. Define the approval process for articles using workflows.
4. Define the knowledge categories that are needed for organizing articles in the knowledge base.
5. If you want to enable users to ask and answer questions in the knowledge base, activate Social Q&A on page 1388.
6. If you want a custom knowledge homepage, ask your ServiceNow administrator to create it.

Next steps

Let users in your organization know that they can start creating and searching articles in the knowledge base. For details, refer users to the Knowledge Management guide for users on page 1460.

If you have the knowledge_manager role, there are many other tasks that you can perform to maintain the knowledge base. You can pin articles so they are featured prominently in the search results and on homepages. You can also assign other users as managers of a knowledge base. For details, see Knowledge manager on page 1399.

Activate the Knowledge Management Advanced plugin

Activate the Knowledge Management Advanced plugin (com.snc.knowledge_advanced) to enable advanced features for Knowledge Management.

Role required: admin

The Knowledge Management Advanced plugin includes feature code and demo data.

The Knowledge Management Advanced Installer plugin (com.snc.knowledge_advanced.installer) is used to activate the Knowledge Management Advanced plugin.

**Note:** The Knowledge Management Advanced plugin is not automatically activated with the Knowledge Management v3 application.

This plugin performs two validation steps prior to activation.

- Determines if there are any active Knowledge Management v2 knowledge bases.
- Determines if there is a unique database index on the Number field. If a unique constraint has been added to the Number field, the plugin activation fails. Follow the instructions listed in KB0634959 to perform corrective steps to resolve the issue.

You need access to HI to be able to view KB articles.
The Knowledge Management Advanced plugin activates the following features:

- Article Versioning
  Customers must migrate to Knowledge Management v3 completely to use article versioning.
- Article Subscriptions
  The Knowledge Management Advanced plugin activates the Subscriptions and Activity Feed Framework plugin (com.snc.activity_subscriptions).
- Article Quality Index
- Article Templates
- In-Context Article Creation
- External Content Integration
  Activating the Knowledge Management - External Content Integration plugin automatically activates the Knowledge Management Advanced Installer plugin.
- Knowledge User Criteria Diagnostics
- Actionable Knowledge Feedback

Demo data is included as part of the Knowledge Management Advanced plugin. If the validation step performed by the Knowledge Management Advanced Installer plugin completes successfully, the Knowledge Management Advanced plug in is activated automatically. However, the demo data is not included in this activation. To load the demo data, go to the Knowledge Management Advanced plugin page, click the Load Demo Data Only related link, and then click OK.

1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.
   If the plugin depends on other plugins, these plugins are listed along with their activation status.
   If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).
4. If available, select the Load demo data check box.
   Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.
   You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.
5. Click Activate.

Knowledge Management roles

Certain roles are required to use Knowledge Management functionality.

<table>
<thead>
<tr>
<th>Role</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any role</td>
<td>All users with at least one ServiceNow role can create and edit knowledge articles. Some knowledge bases may limit this to only certain users.</td>
</tr>
<tr>
<td>Role</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>knowledge</td>
<td>Users with the knowledge role can contribute to the default knowledge base and access the Knowledge application menu.</td>
</tr>
<tr>
<td>knowledge_manager</td>
<td>Knowledge managers perform administrative functions for knowledge bases they manage such as defining categories, pinning important articles, and approving changes to articles. Users selected as managers of a knowledge base receive this role automatically.</td>
</tr>
<tr>
<td>knowledge_admin</td>
<td>Knowledge administrators can create new knowledge bases and manage all knowledge bases.</td>
</tr>
<tr>
<td>knowledge_coach</td>
<td>Knowledge coaches perform AQI surveys on articles and can write, edit and review knowledge management articles.</td>
</tr>
<tr>
<td>knowledge_domain_expert</td>
<td>Knowledge domain experts perform AQI surveys on articles and can write, edit and review knowledge management articles.</td>
</tr>
<tr>
<td>admin</td>
<td>Administrators can configure knowledge workflows, set knowledge properties, and manage knowledge forms and homepages.</td>
</tr>
</tbody>
</table>

Administrators assign these roles to the users and groups who maintain the knowledge content.

### Knowledge homepage

The Knowledge homepage displays knowledge articles and social Q&A questions organized by knowledge base and category, as well as featured content and popular articles.

To view the default knowledge homepage, navigate to Self-Service Knowledge.

**Note:**

The knowledge homepage is not compatible with Internet Explorer 9 or earlier. Using one of these browsers will cause you to be redirected to the legacy knowledge portal.

The Knowledge V3 home page is not customizable. Use the Knowledge Management Service Portal for an easily configurable user experience.
If you access knowledge from a service management application, the knowledge homepage for the associate application opens.

From the homepage, you can import a Word document to a knowledge base using the Import Articles button. You can also create a new article using the Create An Article button, or ask a question using the Post a Question button.

- Import a Word document
- Create an article
- Ask a question
Note: You must have user criteria "Can contribute" permission for at least one active knowledge base, otherwise these buttons do not appear. See Knowledge Management v3 migration on page 1444 and Knowledge manager on page 1399.

You can select a knowledge base to browse articles and questions within that knowledge base. You can view only knowledge bases you can access.

Articles and questions are organized by category or by tag. Categories are listed alphabetically. While browsing, you can filter content by type to view only knowledge articles, only social Q&A questions, or only unanswered questions. You can sort content by most recent update or by number of views.

An administrator can configure the knowledge homepage to display the number of articles and questions within each category. This count includes articles and questions from subcategories. To display the article and question count, set the knowledge homepage property Display or hide the count of articles and questions in the category and child categories (glide.knowman.show_number_on_categories) to true.

Knowledge search

You can search for knowledge articles and social Q&A questions from the knowledge homepage using the search bar at the top of the page.
Search results include only articles and questions you are authorized to read. The search results count does not take into consideration any security rules set for the articles; therefore, the number of articles you could access may be lower than the count displayed in the search results page. Documents that are attached to articles are also listed in the search results (for those articles to which you have access).

**Note:** To change how the attachments are displayed in the search results, set the How to display attachments in Knowledge Search Results glide.knowman.search.attachment property. Attachments can be displayed with a snippet, link only, or not at all.

To use wildcards in your search, using the application navigator, navigate to Contextual Search Search Contexts Knowledge Base Search and enable wildcard search.

You can sort knowledge content by relevancy, most recent update, or number of views.

You can filter results using the check boxes that appear. Filtering options appear depending on the search text.

### Table 544: Filtering options

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Select if you want to view knowledge articles, social Q&amp;A questions, or both. This option is only available if Social Q&amp;A is enabled.</td>
</tr>
<tr>
<td>Knowledge Bases</td>
<td>Select a knowledge base to search. You can select only knowledge bases you can access. If you do not select a specific knowledge base, search results include articles and questions from all knowledge bases that you can access. You can also select a knowledge base from the choice list in the search bar. For pinned articles, only those in the selected knowledge base in the corresponding language appear.</td>
</tr>
<tr>
<td>Categories</td>
<td>Select one or more knowledge categories. Categories are listed alphabetically.</td>
</tr>
<tr>
<td>Authors</td>
<td>Select one or more authors.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Language</td>
<td>The multi-language search feature is available when more than one supported language is enabled.</td>
</tr>
</tbody>
</table>

1. To enable multi-languages, activate the I18N: Knowledge Management Internationalization Plugin v2 plugin (com.glideapp.knowledge.i18n2) or activate one of the internationalization plugins for the language you require.

   **Note:** Activating internationalization plugins for any of the available languages automatically activates the I18N: Knowledge Management Internationalization Plugin v2 plugin.

2. To display search results in all available languages simultaneously, enable the glide.knowman.enable_multi_language_search property.

   a. Navigate to Knowledge Administration Properties Knowledge Search Properties Enable multi language search and select the Yes check box.

   b. Enter sys_properties.list in the filter navigator, search for the property to configure, and in the Value field, enter true.

   **Note:** By default, the glide.knowman.enable_multi_language_search property is not enabled. Search results are displayed based on the language you select in the language filter on the Search page.

---

**Domain separation and Knowledge Management**

This is an overview of domain separation and Knowledge Management. Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.

**Overview**

Support: Level 2
Domain separation is supported in this application. Not all ServiceNow applications support domain separation; some include limitations on the data and administrative settings that can be domain separated. To learn more, see Application support for domain separation.

Domain separation works differently at different access levels of an application. In Knowledge Management, data, requester and fulfills access to knowledge bases are domain separated.

**How domain separation works in Knowledge Management**

In Knowledge Management the following rules apply:

Data: At the data level of domain separation, data visibility is separated from one domain to another. Knowledge bases, user criteria, articles, categories, article feedback, article versions, article templates, and external sources are domain separated in the base system.

Requester: Requester activities are supported within tenant domains. Users can search; view; comment; and rate articles of their domain, any child domain, and global domains, provided that feedback is enabled and the knowledge base settings grant them read access to articles.

- Users in the global domain can access articles in all the domains if read access is granted at knowledge base and/or article level.
- Users in the parent domain can access articles in that domain, global, and all of its child domains if read access is granted at knowledge base and/or article level.
- Users in the child domain can access articles in that domain and the global domain if read access is granted at knowledge base and/or article level.

Fulfiller: The application can be used by the Fulfiller within the tenant domains as a tenant domain-owned application. Users are allowed to author articles in knowledge bases of their domain, any child domain, and the global domain if the knowledge base has user criteria set up to grant contribute access.

- Articles are automatically saved to the user’s current domain when the article is created.

See Select user criteria for a knowledge base on page 1400 to learn how to control which users create, read, write, and retire knowledge articles within a knowledge base.

See Select user criteria for an article on page 1408 to learn how to control read access to users at the article level.

**Use cases**

This image demonstrates a basic domain hierarchy that is available in the base system.
## Requester use cases

<table>
<thead>
<tr>
<th>User domain</th>
<th>Knowledge base domain</th>
<th>Read user criteria domain</th>
<th>Article domain domain</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global</td>
<td>Global</td>
<td>Global</td>
<td>Global</td>
<td>Can view, comment, rate articles.</td>
</tr>
<tr>
<td>Parent domain (TOP)</td>
<td>Global</td>
<td>Parent domain (TOP)</td>
<td>Parent domain (TOP)</td>
<td></td>
</tr>
<tr>
<td>Child domain (TOP/ACME)</td>
<td>Child domain (TOP/ACME)</td>
<td>Child domain (TOP/ACME)</td>
<td>Child domain (TOP/ACME)</td>
<td></td>
</tr>
<tr>
<td>MSP domain (TOP/MSP)</td>
<td>MSP domain (TOP/MSP)</td>
<td>MSP domain (TOP/MSP)</td>
<td></td>
<td></td>
</tr>
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<td>Parent domain (TOP)</td>
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<td>Global</td>
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<td>Global</td>
<td>Can view, comment, rate articles.</td>
</tr>
<tr>
<td>User domain</td>
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<td>Read user criteria domain</td>
<td>Article domain</td>
<td>Result</td>
</tr>
<tr>
<td>-------------</td>
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<td>--------</td>
</tr>
<tr>
<td></td>
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<td>MSP domain (TOP/MSP)</td>
<td>MSP domain (TOP/MSP)</td>
<td></td>
</tr>
</tbody>
</table>

**Fulfiller use cases**

<table>
<thead>
<tr>
<th>User domain</th>
<th>Knowledge base domain</th>
<th>Contribute user criteria domain</th>
<th>Article domain</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global</td>
<td>Global</td>
<td>Global</td>
<td>Global</td>
<td></td>
</tr>
<tr>
<td>Parent domain (TOP)</td>
<td>Parent domain (TOP)</td>
<td>Parent domain (TOP)</td>
<td>Parent domain (TOP)</td>
<td>Can author, update, view, comment, rate articles.</td>
</tr>
<tr>
<td>Child domain (TOP/ACME)</td>
<td>Child domain (TOP/ACME)</td>
<td>Child domain (TOP/ACME)</td>
<td>Child domain (TOP/ACME)</td>
<td></td>
</tr>
<tr>
<td>MSP domain (TOP/MSP)</td>
<td>MSP domain (TOP/MSP)</td>
<td>MSP domain (TOP/MSP)</td>
<td>MSP domain (TOP/MSP)</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>User domain</th>
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<th>Contribute user criteria domain</th>
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<tbody>
<tr>
<td>Parent domain (TOP)</td>
<td>Global</td>
<td>Global</td>
<td>Global</td>
<td></td>
</tr>
<tr>
<td>Child domain (TOP/ACME)</td>
<td>Global</td>
<td>Global</td>
<td>Global</td>
<td></td>
</tr>
</tbody>
</table>

**Known Issues**

- Knowledge Searches [ts_query_kb], Views [kb_use], and Uses [kb_use] are not domain separated.
- The following AQI tables are not domain separated:
  - AQI Checklist [kb_quality_checklist]
  - Checklist Question [kb_checklist_question]
  - Article Checklist Summary [kb_article_checklist_summary]
  - Article Checklist Answer [kb_article_checklist_answer]
- Comment provided by a user on an article is stored in article’s domain instead of user domain.
Social Q&A

If Social Q&A is activated for a knowledge base, you can ask questions and respond to questions from other users. You can also vote on helpful questions and answers.

Social Q&A extends the Knowledge application. All questions and answers are associated with a knowledge base. Social Q&A uses Knowledge access controls, search, and the knowledge homepage.

Social Q&A is available on mobile devices using the mobile knowledge interface. You can perform all Social Q&A functions on mobile, such as asking and answering questions.

Note: Social Q&A is not compatible with Internet Explorer 9 or earlier. Navigating to a Social Q&A page using one of these browsers will cause a browser support warning to appear.

Enable social Q&A for a knowledge base

As a knowledge manager, you can enable social Q&A for a knowledge base you manage.

Role required: knowledge_manager

You can set the limit for the number of times users can post questions, answers, and comments, or subscribe to the questions using the Knowledge Social Q&A properties section.

All Social Q&A questions and answers are associated with a knowledge base. The Enable social questions and answers check box on the Knowledge Base form controls if users can view and ask questions.

Social Q&A uses user criteria from the knowledge base to determine which users have access to questions. A user must meet the criteria defined in the knowledge base Can Read related list to view or contribute to Social Q&A questions, answers, and comments associated with that knowledge base.

Note: The Can Contribute related list does not control the ability to contribute to Social Q&A. Users that meet the Can Read criteria for a knowledge base can also contribute questions, answers, and comments.

1. Navigate to Knowledge Knowledge Bases.
2. Select a knowledge base you manage.
3. Select the Enable social questions and answers check box.
   This check box only appears if the Social Q&A plugin has been activated.
4. Click Update.

You can disable Q&A for a knowledge base by clearing the Enable social questions and answers check box. Disabling Q&A does not delete existing questions and answers associated with this knowledge base, but prevents users from browsing or searching for those questions and answers.

Social Q&A questions

Social Q&A organizes information by question.

You can browse and search for questions from the Knowledge homepage (Self-Service Knowledge). Questions appear along with knowledge articles organized by knowledge base, category, and tags.

Click on a question to view the question details, as well as responses and comments. You can add responses and comments, vote on existing responses, share questions, and edit your own questions and answers from the question details. Click on a picture profile to view the user's profile.
Ask a social Q&A question

As a Social Q&A user, you can ask questions that other users can respond to.

Roles required: None

1. Navigate to Self-Service Knowledge.
2. Click Post a Question.
3. Enter a value for the following fields.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>Enter the question you have.</td>
</tr>
<tr>
<td>Question details</td>
<td>Enter additional details about the question that may help other users provide an answer.</td>
</tr>
<tr>
<td>Knowledge base</td>
<td>Select the knowledge base this question relates to. You can select only knowledge bases configured to allow Q&amp;A.</td>
</tr>
<tr>
<td>Category</td>
<td>Select the knowledge category this question relates to. You can select only categories within the selected knowledge base. Questions without a category appear on the knowledge homepage in the (empty) category.</td>
</tr>
<tr>
<td>Tags</td>
<td>Enter one or more tags that describe the question.</td>
</tr>
</tbody>
</table>

4. Click Post Question.

To accept the answer, click the Accept link from within the answer. The accepted answer moves to the top of the list of answers. You can unaccept an answer by clicking Unaccept.

**Note:** You must be the owner of the question or the knowledge manager to accept an answer.

Answer a question

As a user, you can answer a question another user has asked. The owner of the question or the knowledge manager can then accept the answer.

Roles required: None

As a knowledge manager or the owner of a question, you can accept an answer as the correct answer. That answer then appears above other answers for the question.

1. Navigate to Self-Service Knowledge.
2. Select a question.
3. Enter an answer in the Your answer field.
4. Click Submit.
Comment on a question or answer

You can comment on a question or an answer to provide additional information relevant to that question or answer.

Roles required: None

1. Navigate to Self-Service Knowledge.
2. Select a question.
3. Within the question or answer you want to comment on, click the Comment link.
4. Enter the comment text. Comments have a maximum length of 140 characters.
5. Click Post comment or press the Enter key.

Edit a question, answer, or comment

You can edit questions, answers, and comments you submit, or in knowledge bases you manage.

Role required: None

1. Navigate to Self-Service Knowledge.
2. Select a question.
3. Within the question, answer, or comment you want to edit, click Edit.
4. Edit the details as needed.
5. When editing a question, click Advanced to make changes to the question record.
6. Click Update.
   Click Undo to discard the changes and close the editor.

Vote on a question or answer

As a Social Q&A user you can vote on a question or answer to promote it.

Role required: None

Vote up questions that you want users to answer, and answers that you believe accurately resolve questions. Alternatively, vote down questions that you do not find useful, or answers that you believe are incorrect. You can vote for each question or answer only once, but you can change your vote.

Answers with a higher score appear above answers with a lower score when viewing a question. A pinned answer appears above other answers regardless of votes.

Note: You cannot vote for your own questions or answers.

1. Navigate to Self-Service Knowledge.
2. Select a question.
3. Click the up or down arrow next to the question or answer you want to vote on. The score for that question or answer changes depending on your vote.

You can change your vote by clicking the other arrow.

Subscribe to a question

You are automatically subscribed to any question you ask, so you receive notifications when another user votes on, comments on, or answers the question. If you want to receive notifications for a question asked by another user, you can manually subscribe to the question.
Role required: None

You automatically subscribe to any question you ask.

1. Navigate to Self-Service Knowledge.
2. Select a question.
3. Click the subscribe icon.

If you want later to stop receiving notifications about this question, click the unsubscribe icon.

Delete a question, answer, or comment

You can delete questions, answers, or comments that you submitted.

You can delete only questions, answers, and comments you submitted. Knowledge managers can delete any question, answer, or comment within knowledge bases they manage.

Role required: None

1. Navigate to Self-Service Knowledge.
2. Select a question or answer.
3. Within the question, answer, or comment you want to delete, click the Delete link.

Deleting a question also deletes all answers and comments associated with that question. Deleting an answer also deletes all comments associated with that answer.

Share a question

You can generate a URL directly to a question and related answers.

Role required: None

1. Navigate to Self-Service Knowledge.
2. Select the question that you want to share.
3. Click Share.

Some browsers do not allow adding content directly to the clipboard. You may need to manually copy the URL from the popup that appears.

Distribute the URL to share the question.

Social Q&A internationalization support

The Social Q&A questions and answers are automatically associated with the language that is set for the interface.

You can only browse and search for questions in the language currently set for the interface. For example, if a Social Q&A user has set French as the interface language, any questions that the user asks is associated with the French language. All Social Q&A users who want to view those questions must have their interface language set to French.

**Note:** For Social Q&A internationalization to take effect, you must clear the platform cache and browser cache after selecting the desired language.
Social Q&A search

Users can search for specific questions from the knowledge homepage.

Social Q&A uses knowledge search to provide search results. Searching knowledge returns questions that contain the search terms in the question title or the question details, or in the accepted answer.

By default, knowledge search results include both knowledge articles and questions. You can filter results using knowledge search controls, such as filtering by knowledge base or author.

Social Q&A results also appear with knowledge articles when using global search.

Social Q&A uses the Contextual Search feature to generate search results. Questions appear in Contextual Search results, such as when creating an incident. The Social QA Question Search Context and Social QA Question Searcher records define the Social Q&A search. To ensure Social Q&A search functions as intended, do not modify these records.

Social Q&A tags

Tags organize questions and provide information about the question subject matter.

Social Q&A shares available tags with other applications allowing you to organize records consistently across the instance. Tags are stored on the Tags [label] table.

You can view a list of tags and filter by tag from the knowledge homepage. Clicking on a tag displays a list of knowledge articles and questions with that tag.

Only users who can edit a question can edit the associated tags. By default, only the question owner and knowledge managers can add or remove tags on questions.

Knowledge feedback

You can view and contribute to feedback on knowledge articles.

Feedback options

Enable or disable the feedback options using the Knowledge article view properties.

You can submit feedback for knowledge articles in these ways:

- Flag an article as incorrect or inappropriate.
- Provide a rating value for the article.
- Mark an article as helpful or not helpful.
- View comments, add a new comment, or reply to existing comments.

Users can view comments directly on the article. Knowledge managers can view the other types of feedback by navigating to Knowledge Feedback.

Administrators and knowledge managers can disable some feedback options using fields on the Knowledge Base form. Administrators can configure feedback options using properties.

Flagging articles

You can flag an article for incorrect or inappropriate content. Click Flag Article in the article header to open a new window, allowing you to enter suggested changes.

The glide.knowman.use_live_feed property controls the display of knowledge article comments.
• If enabled, the system uses live feed to manage and display feedback on knowledge articles. Flagged comments do not appear on the Article View page. Users with the admin, knowledge_admin, and knowledge_manager roles can access flagged articles by navigating to Knowledge Articles All Flagged. Users with the knowledge role can access their flagged articles by navigating to Knowledge Articles My Flagged.

• If disabled, the author of the article and users with the admin, knowledge_admin, and knowledge_manager roles can see all flagged comments. Other users can see only their own flagged comments.

**Note:** You cannot disable flagging for an article until you have disabled the flagging for all feedback comments for that article.

Flagged comments are stored in the Knowledge Feedback (kb_feedback) table but not the Live Feed Messages (live_message) table.

**Rating articles**

The five stars below the article title allow you to indicate the article's effectiveness on a scale of 1 to 5.

**Marking articles**

The question Helpful? at the bottom of the article allows you to indicate the usefulness of the article with a simple Yes or No answer.

**Comments**

Knowledge comments at the bottom of the article use live feed to enable a conversation around a knowledge article. For example, you can post replies to comments, add attachments, or Like comments.

**Request a knowledge base**

If existing knowledge bases do not fit your needs, you can request a new knowledge base through the service catalog. If the request is approved, you are added as the owner of the new knowledge base.

Role required: none

If no knowledge base exists that fit your needs, all users can request a new knowledge base.

1. Navigate to Self-Service Service Catalog.
2. Select Can We Help You?.
3. Select the Request Knowledge Base catalog item.
4. Enter the reason you want the knowledge base, and a name for the knowledge base.
5. Click Submit.

You are notified when the request is approved or rejected. If the request is approved, you are added as the owner of the new knowledge base. You can then assign managers and manage articles in the new knowledge base.

Knowledge bases created through this request process are inactive by default, so you must activate the knowledge base to make it available for users.
Create a knowledge article

Knowledge contributors can create and edit knowledge articles within a knowledge base to share information across your organization.

Users with at least one role can create and edit knowledge. These users are known as knowledge contributors. Users without any role can read articles and submit feedback, but cannot create or edit articles.

Some knowledge bases may allow only certain users to contribute. For example, a member of the IT department can create knowledge articles in the IT knowledge base, such as desktop support information or articles describing company IT processes.

1. Navigate to Self-Service Knowledge.
2. Click Create An Article.

![Create an Article]

**Note:** You must have user criteria "Can contribute" permission for at least one active knowledge base, otherwise the Create An Article button does not appear. See Knowledge Management v3 migration on page 1444 and Knowledge manager on page 1399.

3. Select an article template.

**Note:** To view an article template, you must activate the article templates feature and enable the desired templates. For more information, see Knowledge article templates.

4. Fill in the fields on the form, as appropriate.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Base</td>
<td>The knowledge base selected for this article.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> An article can only be associated with one knowledge base.</td>
</tr>
<tr>
<td>Category</td>
<td>The category for this article. Select a Knowledge Base before you can select a category. Articles without a category appear on the knowledge homepage in the (empty) category.</td>
</tr>
<tr>
<td>Published</td>
<td>The date this knowledge article was published. This value is set when the article is published.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Valid to</td>
<td>The date this knowledge article expires. Articles do not appear in search results after the valid to date, or if the valid to date is empty.</td>
</tr>
<tr>
<td>Article type</td>
<td>The type of article, either HTML or wiki. <strong>Note:</strong> This field is only visible in the standard template.</td>
</tr>
<tr>
<td>Workflow</td>
<td>[Read-Only] The publication state of the article, such as Draft or Published. When inserting a new article from an existing article, the state of the new article is reset to Draft.</td>
</tr>
<tr>
<td>Source</td>
<td>The task this knowledge article was created in response to, if any. This field is set automatically when you create the knowledge article from a task record.</td>
</tr>
<tr>
<td>Attachment link</td>
<td>Check box for downloading an attached file automatically when a user accesses the article, instead of opening the article view. Add one or more attachments to the article to use this option. <strong>Note:</strong> You may attach multiple files, but most web browsers permit users to download only the first one. To ensure download of all the files, bundle them into an archive, such as with WinZip, and attach the archive.</td>
</tr>
<tr>
<td>Display attachments</td>
<td>Check box for displaying attachments to users viewing this knowledge article. Attachments appear below the article text. Add one or more attachments to the article to use this option.</td>
</tr>
<tr>
<td>Short description</td>
<td>The title of the article. This title appears when browsing and searching knowledge, and at the top of the article.</td>
</tr>
<tr>
<td>Text</td>
<td>Content for the article. Use the <strong>HTML editor</strong> to create content. A preview of the content appears when browsing and searching knowledge.</td>
</tr>
</tbody>
</table>

5. Click Submit to create the article.

After saving the article record, you can add tags to further organize the article.

Any additional steps required to publish the article, such as approvals, depend on the publishing workflow for the knowledge base.
Select a knowledge article category

Knowledge articles within a knowledge base are grouped by category. These groups can help you define the knowledge base taxonomy, and can help users find articles within that knowledge base.

As a knowledge contributor, when editing a knowledge article you can select categories using the Category picker, and add or edit categories if enabled for the knowledge base.

1. Click the reference lookup icon beside the Category field.

2. Select an existing category, or click the add category icon (+) to add a new category.
   After you select a category, you can click the pen icon to rename that category. Press the enter key or click outside the selected category to save the change.
   
   **Note:** Clicking Cancel while selecting a category cancels selecting a new category, but does not revert any changes you make to the categories such as renaming or adding new categories.

3. Fill in the fields on the form, as appropriate.
4. Select or add a subcategory.
5. Click OK.

Move a knowledge article

You can move articles between knowledge bases.

1. Edit a knowledge article.
2. Change the Knowledge Base field value.
   After moving an article, the Apply Default Values dialog box prompts you to populate certain fields in the article with default values from the new knowledge base. If the new knowledge base has no default values, the dialog box does not appear.
3. Click OK to overwrite fields with the default values, or Cancel to leave all fields unchanged.
   A knowledge manager can define default values for articles in knowledge bases you manage using the Set default knowledge field values field on the Knowledge Base form.
4. Click Update.

Retire a knowledge article

Retired knowledge articles are not available to users except for administrators and knowledge administrators who can view them.

A knowledge article has an associated retirement workflow, similar to the publishing workflow. This allows administrators to configure these workflows, defining an approval and review process for retiring knowledge if appropriate.

When editing an article, click Retire to launch the retirement workflow associated with that article.

Retired knowledge articles cannot be searched for by external users or customers. To reuse a retired article, create a new article with the same content, which is published once approved.

Create knowledge from an incident or problem

To create knowledge from an incident or problem, select the Knowledge check box on the incident or problem form and close the incident or problem record.

For detailed information on creating knowledge from an incident, refer to Create a knowledge article from an incident

The short description from the incident or problem becomes the knowledge article title. Articles created this way are added to the knowledge base specified in the property glide.knowman.task_kb.

Depending on the value of the glide.knowman.submission.workflow property, knowledge created from an incident or problem may require additional approval. When this property is true, a submission record is created instead of a knowledge article. A user with the knowledge role must approve the submission to create a knowledge article.

Approving a submission creates a new knowledge article using the submission content.

1. Navigate to Knowledge Open Submissions.
2. Select a submission record.
3. Review the submission to ensure the content and settings are correct.
4. Click Create Article.
   A new draft knowledge article is created. Articles created this way are added to the knowledge base specified in the property glide.knowman.task_kb.

You can edit the new knowledge article before publishing it, such as to select a category.

Import a Word document to a knowledge base

Import a Microsoft Word document to create a new knowledge article.

Role required: None. You must have user criteria "Can contribute" permission for at least one active knowledge base. If you cannot contribute, the Import Articles button does not appear.

Note: An administrator can control the visibility of the Import Articles button by setting the other knowledge property Hide the 'Import' functionality (button and drag-n-drop) for all users (glide.knowman.import.hide_import_functionality) to true.

Importing documents to knowledge is available only from a computer browser. You cannot import documents from a mobile device.

You can import Microsoft Word .doc and .docx files.
Note: The file extension must be lowercase.

When you import a document, text content from the document is used to create the knowledge article. The articles support all editing functions supported by the TinyMCE editor. All HTML supported by the TinyMCE editor such as tables, lists, and links, as well as styling such as bold and italics, are preserved. Images from the document are added as attachments to the knowledge article and embedded in the article body.

Note:

You can import multiple files at a time. Closing the browser or navigating away cancels any in-progress uploads but does not delete articles created from completed imports.

You cannot import documents to knowledge from mobile devices.

The following styles and elements are preserved when importing a .doc or .docx file into a knowledge base. Styles and elements not included in this list may not be preserved when importing a document.

- Titles
- Headings
- Images
- Links
- Bold text
- Italic text
- Underlined text
- Ordered and unordered lists
- Tables

Note: Only default heading settings are supported. Custom heading styles are imported using the default settings for those styles. Table styling and borders are not supported.

1. Navigate to Self-Service Knowledge.
2. Perform one of the following actions.
   - Click Import Articles and select one or more document files.
   - Drag one or more document files onto the knowledge homepage.
3. Select the Knowledge base to add the new article to.
   You can select only knowledge bases you can contribute to.
4. Select a Category from within that knowledge base.

   Note: Use the category picker to add a category. The picker does not differentiate between different category levels. You can select a category or sub category and add it to the Category field.

5. Select the Publish check box to start the publishing workflow for each imported article immediately after the import finishes.

   This check box applies only when importing to v3 knowledge bases and only if the Show publish checkbox on the knowledge import pop-up property is set to Yes on the Knowledge Management properties form. You cannot automatically publish articles imported to v2 knowledge bases.

   Knowledge v2 articles go into Draft state. Knowledge v3 articles go into Review or Published state, depending on the workflow attached to the knowledge base (Approval Publish or Instant Publish).

6. Click Import.
A new article is created in the selected knowledge base and category using the content from the uploaded document. If you uploaded multiple documents, one article is created for each. If you use knowledge internationalization, the language of the new article is set to the currently selected system language.

After the upload completes, a popup window appears displaying the number and short description of the newly-created articles. Click an article to view the full record.

If any errors occur during the upload, a popup window appears to display the error.

Create a knowledge article from a customer service case

Reuse information from a customer service case by creating knowledge articles from cases.

Your administrator must enable creation of articles from customer service cases.

Role required: sn_customerservice_agent or knowledge

1. Navigate to Customer Service Cases All.
2. Select a case from which you want to create a knowledge article.
3. Click Create Knowledge.
   The relevant fields are automatically copied from the case to the record that opens.
4. In the Knowledge base field, enter the name of the knowledge base in which you want this article to display.
5. Click Submit.

Knowledge manager

Having multiple knowledge bases allows an organization to spread management responsibilities across multiple users, known as knowledge managers.

As a knowledge manager, you can assign other managers, define category structures, configure which users can read and contribute articles, move and pin articles, and modify most fields on the Knowledge Base form. You can also approve the publishing or retiring of knowledge articles in those knowledge bases. You can enable Social Q&A for your knowledge bases if the Social Q&A application is active.

The primary manager of a knowledge base is the owner of that knowledge base. Each knowledge base must have one owner. There may be any number of additional managers for each knowledge base. All managers of a knowledge base, including the owner, automatically receive the knowledge_manager role.

Pin a knowledge article

You can pin a knowledge article to appear in the Featured content section of the knowledge homepage and at the top of knowledge search results page.

Role required: knowledge_manager, knowledge_admin, or admin

Pinning associates an article to specific keywords. You can search a keyword in the knowledge service portal or search results page to display articles in the Featured content section or at the top of the knowledge search results list.

- To display articles in the Featured content section, add a default keyword in the glide.knowman.default_keyword property Value field and add the same keyword to all articles you want to display in that section.
• To display articles at the top of the knowledge search results list, add a list of keywords to each article you want to display at the top of the list.

1. Navigate to Knowledge Knowledge Bases.
2. Select a knowledge base.
3. In the Featured content related list, click New.
4. In the Knowledge field, search for and select the desired article.
5. In the Keywords field, click the lock/unlock toggle icon.
6. Click the lookup icon to open the Knowledge keywords list.

Note: Each keyword must be a single word and cannot contain spaces.

7. Select the keyword to add for this article.
   • Add the default keyword to display this article in the Featured content section during search.
   • Add all related keywords for the article to display it at the top of the knowledge search results page during search.

Note: You can create knowledge keywords, if it does not already exist in the list, and then add it to the article.

8. Click the lock/unlock toggle icon to add the keywords to the article.
9. Click Submit.

Create a user criteria record in Knowledge Management

You can create or modify a user criteria record in Knowledge Management. User criteria is used to control what users, groups, roles, companies, locations, and/or departments can access knowledge bases and articles.

Role required: user_criteria_admin

1. Navigate to Knowledge Administration User Criteria.
2. Click New or open a record.
3. Fill out the fields on the form as required.
   For field descriptions, refer to Create a user criteria record in Service Catalog
   
   Note: Including scripts in user criteria records can decrease performance, because scripts are evaluated dynamically.

4. Click Submit.

Select user criteria for a knowledge base

You can specify user criteria to control which users can create, read, write, and retire knowledge articles within a knowledge base.

Role required: knowledge_manager, knowledge_admin, or admin

User criteria refers to knowledge base records that determine the users who can read or contribute to a knowledge base. User criteria definitions:

- canRead users who can read all knowledge base articles
cantRead  users who cannot read, create, or modify articles in the knowledge base

canContribute  users who can read, create, and modify articles in the knowledge base

cantContribute  users who cannot create or modify articles in the knowledge base

Set user criteria for a knowledge base without explicit roles

If a knowledge base has no user criteria defined, all users can read its articles. Any user having at least one role can create and edit articles, unless they are members of the cantContribute user criteria. If a knowledge base has canRead user criteria, but no canContribute user criteria, all users with at least one role can access and modify the knowledge base.

Set user criteria for a knowledge base with explicit roles

If you create a new knowledge base with the Explicit Roles plugin active, only users with snc_internal role can access the knowledge base. To make all existing knowledge bases that do not have the canRead or canContribute user criteria accessible only to users with the snc_internal role, activate and run the Fix unsecured knowledge bases fix script.

This video demonstrates how to control Knowledge Management access through user criteria.

1. Navigate to Knowledge Knowledge Bases.
2. Select a knowledge base you manage.
3. Access one of these related lists, and then select or create user criteria records.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
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<tbody>
<tr>
<td>Can read</td>
<td>Users who meet one of these criteria can read articles in this knowledge base.</td>
</tr>
<tr>
<td>Can contribute</td>
<td>Users who meet one of these criteria can create and edit articles in this knowledge base.</td>
</tr>
</tbody>
</table>
Can Read
Leveraging User Criteria to grant read access to Knowledge Bases & Knowledge Articles

User role: admin, knowledge_admin, KB-owner, KB-manager, CanContribute

No

User has Blacklisted role

Yes → No Access to KB and/or Article(s)

No

User has Whitelisted role, or KB requires no role

No

Yes → Can Read KBs and/or Article(s)
Can Contribute
Leveraging User Criteria to grant access
to Knowledge Bases & Knowledge
Articles

User role: admin, knowledge_admin, KB-owner, KB-manager

No

User has Blacklisted role

Yes → No Access to KB and/or Article(s)

No

User has Whitelisted role, or KB requires no role

Yes

Can Contribute to KB and/or Article(s)
### Table 547: Order of System Validation (L->R)

<table>
<thead>
<tr>
<th>Contribute</th>
<th>Read</th>
<th>Result</th>
</tr>
</thead>
<tbody>
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<table>
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<tr>
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<th>Read</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>cantContribute (1)</td>
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<tr>
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<td>User C</td>
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<td>Contribute</td>
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<td>Contribute</td>
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<tr>
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<td>empty</td>
<td>User C</td>
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<td>User C</td>
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<td>User A</td>
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<td>Contribute</td>
<td>Read</td>
<td>Result</td>
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<td>--------</td>
</tr>
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<td>User D</td>
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<td>Contribute</td>
<td>Read</td>
<td>Result</td>
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<tr>
<td>User D</td>
<td>User C</td>
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</table>

1. User D - > Denied Create
2. User C - > Create, Read
3. All Users - > Read

<table>
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<tr>
<th>User D</th>
<th>User C</th>
<th>empty</th>
<th>User A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

1. User D - > Denied Create, Read
2. User C - > Create, Read
3. User A - > Read

<table>
<thead>
<tr>
<th>User D</th>
<th>User C</th>
<th>User B</th>
<th>empty</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
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</tbody>
</table>

1. User D - > Denied Create
2. User C - > Create, Read
3. User B - > Denied Read
4. All Other Users - > Read

<table>
<thead>
<tr>
<th>User D</th>
<th>User C</th>
<th>User B</th>
<th>User A</th>
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<tbody>
<tr>
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</tbody>
</table>

1. User D - > Denied Create, Read
2. User C - > Create, Read
3. User B - > Denied Read
4. User A - > Read

**Note:** In the tables of rules, an implicit last rule is: All Users - > Denied Create, Read.
Select user criteria for an article

You can specify user criteria for an article to control which users can read the article.

If an article has no user criteria selected, the article is available to all users who have access to that knowledge base (based on the user criteria for the knowledge base). Knowledge base user criteria restrictions override article-level user criteria. For example, a knowledge base that is configured to restrict user access overrides any access granted at the article level.

On the article level, if Can read user criteria is defined, only those users specified can read the article. If an article has Cannot read user criteria defined, those users specified are denied reading the article. Cannot read user criteria overrides Can read user criteria for articles.

1. Navigate to Self-Service My Knowledge Articles .
2. Select an article.
3. Select the desired user criteria for the Can Read and Cannot Read fields.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can Read</td>
<td>Users who meet one of these criteria can read the article.</td>
</tr>
<tr>
<td>Cannot Read</td>
<td>Users who meet one of these criteria are denied reading the article (regardless of the Can Read setting for the user).</td>
</tr>
</tbody>
</table>

**Note:** If the Can Read and Cannot Read fields are not visible, add the fields to the form by configuring the form layout (click the form context menu icon and select Configure Form Layout ).
KB Level Contribute Access?

No

KB Level Read Access?

No

No Read Access to Article

Yes

User has article level blacklisted role

Yes

Can Read Article

User has whitelisted role, or Article requires no role

No
<table>
<thead>
<tr>
<th>Knowledge base level</th>
<th>Article level</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>Read</td>
<td>cantRead</td>
</tr>
<tr>
<td>Contribute</td>
<td>Yes</td>
<td>N/A</td>
</tr>
<tr>
<td>Yes</td>
<td>empty</td>
<td>empty</td>
</tr>
<tr>
<td>No</td>
<td>empty</td>
<td>User</td>
</tr>
<tr>
<td>Yes</td>
<td>empty</td>
<td>empty</td>
</tr>
<tr>
<td>No</td>
<td>empty</td>
<td>User</td>
</tr>
<tr>
<td>Yes</td>
<td>User</td>
<td>User</td>
</tr>
</tbody>
</table>

**Note:** When article-level read access is assigned to an article, only the user who belongs to that particular user criteria can read the article. Other users are restricted.

**Define a knowledge article category**

Each knowledge base has a hierarchy of categories that organizes the articles.

You must have CanContribute access to the knowledge base or have a knowledge_admin or admin role.

A category can be a top-level category or a child category. The parent of a child category can be a top-level category or another child category. By making a category the child of another child category you can create a category structure with any number of levels.

You can create and edit categories separately for each knowledge base.

1. Navigate to Knowledge Knowledge Bases.
2. Select a knowledge base you manage.
3. Choose an option.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create a top-level category.</td>
<td>Navigate to the Knowledge Categories related list and click New.</td>
</tr>
<tr>
<td>Create a child category.</td>
<td>Expand an existing category and click New within the expanded section.</td>
</tr>
</tbody>
</table>
4. Enter a Label for the category. The label appears as the name of the category.
5. Enter a Value you can use when referencing the category in scripts.
6. Click Submit.

In addition to using categories defined by a knowledge manager, knowledge contributors can add and edit categories when editing an article.

**Assign a knowledge base manager**

You can assign users as managers of a knowledge base.
Role required: knowledge_admin, or admin

1. Navigate to Knowledge Knowledge Bases.
2. Select a knowledge base you manage.
3. In the Managers field, click the unlock icon.
4. Add one or more users.
5. Click Update.

After you save the knowledge base record, users selected as managers automatically receive the knowledge_manager role if they do not have it already.

You can remove a knowledge base manager by removing that user from the Managers field. If the user is not a manager of any other knowledge base, the knowledge_manager role is removed from that user.

User criteria diagnosis for Knowledge Management

Manage user access to a knowledge base or an article using user criteria diagnostics. Understand what access users have to a knowledge base or an article and determine which user criteria define those permissions.

User access to a knowledge base or an article could be restricted based on:

- Domain separation
- Access control list (ACL) rules
- Knowledge work flows
- User criteria set for a knowledge base or an article

This feature only takes into consideration user access to knowledge bases and articles based on user criteria.

Activating user criteria diagnostics

The user criteria diagnostics feature is activated with Knowledge Management v3 (com.snc.knowledge3) plugin.

Diagnose user access to a knowledge base

Identify which users have access to a knowledge base and what enables that access.

Role required: knowledge_manager, knowledge_admin, or admin

1. Access the User Criteria Diagnostics landing page using one of these options:

<table>
<thead>
<tr>
<th>To access</th>
<th>Navigate to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using the application navigator</td>
<td>Knowledge Administration User Criteria Diagnostics</td>
</tr>
</tbody>
</table>
2. To access

To access
Navigate to

<table>
<thead>
<tr>
<th>From a knowledge base</th>
<th>1. Knowledge Administration Knowledge Bases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Select the knowledge base to diagnose user access.</td>
</tr>
<tr>
<td></td>
<td>3. In the Related Links section, click Run User Criteria Diagnostics.</td>
</tr>
</tbody>
</table>

The User Criteria Diagnostics landing page appears with the Select knowledge base field pre-populated.

2. To diagnose user access:

   a) In the Select user field, select a user.

   b) From the Select record type choice list, select Knowledge base.

   c) In the Select knowledge base field, select a knowledge base.

   Every time you select a different user, record type, or knowledge base, the page refreshes and displays data for the selected user.

   d) Click Diagnose.

   The page displays these details:

   - A warning message indicating that access restrictions based on domain separation, ACL rules, or knowledge work flows override the permissions defined by user criteria.
   - Which user criteria provides read or read and contribute access for this user to the knowledge base and what type of user criteria definition enables this access.
   - Whether a role that the user has (knowledge_manager, knowledge_admin, or owner of the knowledge base) enables this access.
   - For a user with no access to this knowledge base, which user criteria may be modified to grant the access.

The following image shows an example of a diagnosis where the user Alene Reback does not have access to the IT knowledge base.

Alena can get access to the knowledge base if:

- Alena is added to one of the existing user criteria defined in the knowledge base.
- Alena is added to a new user criteria that is defined and added to the knowledge base.

Click the IT knowledge base link and provide the access by adding Alena to a user criteria for this knowledge base.
User Criteria Diagnostics

Select user: Alene Rabeck
Select record type: Knowledge Base
Select knowledge base: IT

No Access

Alene Rabeck does not have access to knowledge base (IT).

⚠ If ACLs were applied to this Knowledge Base, the ACLs will override the permissions defined by user criteria.

How to Provide Access

To provide access to knowledge base (IT), add Alene Rabeck to one or more of the following user criteria.

<table>
<thead>
<tr>
<th>User Criteria</th>
<th>Access Type</th>
<th>Set on</th>
</tr>
</thead>
<tbody>
<tr>
<td>The ACME North America IT Department</td>
<td>Can Contribute</td>
<td>Knowledge Base</td>
</tr>
<tr>
<td>All ACME North America employees</td>
<td>Can Read</td>
<td>Knowledge Base</td>
</tr>
<tr>
<td>All ACME Corporation employees</td>
<td>Can Read</td>
<td>Knowledge Base</td>
</tr>
</tbody>
</table>

1 to 3 of 3 results
Diagnose user access to an article

Identify which users have access to an article and what enables that access.

Role required: knowledge_manager, knowledge_admin, or admin

1. Access the User Criteria Diagnostics landing page using one of these options:

<table>
<thead>
<tr>
<th>To access</th>
<th>Navigate to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using the application navigator</td>
<td>Knowledge Administration User Criteria Diagnostics.</td>
</tr>
</tbody>
</table>

From an article

1. Knowledge Administration Knowledge Bases.
2. Select the knowledge base that has the article to diagnose for user access.
3. In the Knowledge related list, select the article.
4. In the Related Links section, click Run User Criteria Diagnostics.

The User Criteria Diagnostics landing page appears with the Select article field pre-populated.

2. To diagnose user access:

   a) In the Select user field, select a user.
   b) From the Select record type choice list, select Article.
   c) In the Select article field, select an article.
      Every time you select a different user, record type, or knowledge base, the page refreshes and displays data for the selected user.
   d) Click Diagnose.
      The page displays these details:
      
      • A warning message indicating that access restrictions based on domain separation, ACL rules, or knowledge work flows override the permissions defined by user criteria.
      • Which user criteria provides read or read and contribute access for this user to the article and what type of user criteria definition enables this access.
      • Whether a role of the user has (knowledge_manager, knowledge_admin, or owner of the knowledge base) enables this access.
      • For a user with no access to this article, which user criteria may be modified to grant the access.

The following image shows an example of a diagnosis where the user Adela Cervantsz has read access to the KB article, KB0000001 v5.0, in the IT knowledge base because Adela belongs to one of the Can Read user criteria defined in the knowledge base.
User Criteria Diagnostics

- Select user: Adela Cervantsz
- Select record type: Article
- Select article: KB0000001 v1.0

Read Access

No user criteria is configured at article level. Adela Cervantsz has Read access to article KB0000001 in knowledge base IT, because the user has Read access to the knowledge base.

⚠ If ACLs were applied to this Article, the ACLs will override the permissions defined by user criteria.
⚠ The article's publication status may also impact the user's access to it. If diagnostic results conflict with the user's access, please check the publication status of the article.

User Criteria Assigned

<table>
<thead>
<tr>
<th>User Criteria</th>
<th>Access Type</th>
<th>Set on</th>
</tr>
</thead>
<tbody>
<tr>
<td>All ACME North America employees</td>
<td>Can Read</td>
<td>Knowledge Base</td>
</tr>
<tr>
<td>All ACME Corporation employees</td>
<td>Can Read</td>
<td>Knowledge Base</td>
</tr>
</tbody>
</table>

1 to 2 of 2 results
Knowledge administration

As an administrator, you are responsible for setting up knowledge bases, configuring knowledge workflows, and customizing knowledge homepages. Most day-to-day management functions are performed by knowledge managers.

The following podcast offers additional information on using the Knowledge Base Application.

Create a knowledge base

Create a knowledge base to provide a self-service platform for users to store, share, and manage content. Configure knowledge bases into product or service categories and manage user access based on permissions. Customize workflows for publishing and retiring articles in the knowledge base.

Understand the requirements for setting up a knowledge base.

Role required: knowledge_admin or admin

1. Navigate to Knowledge Administration Knowledge bases.
2. In the Knowledge Bases list, click New.
3. On the form, fill in the following fields as appropriate:

<table>
<thead>
<tr>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>Unique name for the knowledge base.</td>
</tr>
<tr>
<td>Icon</td>
<td>An image that provides a visual reference to describe the knowledge base. This image is displayed next to all articles from this knowledge base in the article search results page.</td>
</tr>
<tr>
<td>Disable commenting</td>
<td>Check box to disable commenting. If selected, users cannot comment on articles in the knowledge base.</td>
</tr>
<tr>
<td>Disable suggesting</td>
<td>Check box to disable edit suggestions. If selected, users cannot suggest edits to articles in the knowledge base.</td>
</tr>
<tr>
<td>Disable category editing</td>
<td>Check box to disable editing of knowledge categories. If selected, only knowledge managers can add or edit knowledge categories for the knowledge base.</td>
</tr>
<tr>
<td>Checklist</td>
<td>Checklist to evaluate the quality of articles in the knowledge base.</td>
</tr>
<tr>
<td>Owner</td>
<td>The user responsible for the knowledge base. A knowledge base owner can assign other roles to the knowledge base.</td>
</tr>
<tr>
<td>Manager</td>
<td>Users who perform administrative functions on the knowledge base.</td>
</tr>
<tr>
<td>Title</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Publish workflow</td>
<td>The workflow for publishing the articles in the knowledge base.</td>
</tr>
<tr>
<td></td>
<td>• Knowledge - Instant Publish: publishes articles in the knowledge base without requiring an approval.</td>
</tr>
<tr>
<td></td>
<td>• Knowledge - Approval Publish: requests approval from the manager of the knowledge base before moving the articles to the published state.</td>
</tr>
<tr>
<td>Retire workflow</td>
<td>The workflow for retiring the articles in the knowledge base.</td>
</tr>
<tr>
<td></td>
<td>• Knowledge - Instant Retire: retires articles in the knowledge base without requiring an approval.</td>
</tr>
<tr>
<td></td>
<td>• Knowledge - Approval Retire: requests approval from the manager of the knowledge base before moving the articles to the retired state.</td>
</tr>
<tr>
<td>Active</td>
<td>Check box to make the knowledge base visible to all users.</td>
</tr>
<tr>
<td>Enable social questions and answers</td>
<td>Check box to enable social Q&amp;A for articles in the knowledge base.</td>
</tr>
<tr>
<td>Description</td>
<td>A short description to describe the knowledge base.</td>
</tr>
<tr>
<td>Set default knowledge field values</td>
<td>Default configuration settings for the knowledge base.</td>
</tr>
<tr>
<td>Related products</td>
<td>List of products related to the knowledge base content.</td>
</tr>
</tbody>
</table>

4. Right-click the form header and click Save.
5. In the related list section, view or configure the following items related to the knowledge base:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>List of knowledge articles stored in this knowledge base.</td>
</tr>
<tr>
<td>Questions</td>
<td>List of Social Q&amp;A questions stored in this knowledge base.</td>
</tr>
<tr>
<td>Can Read</td>
<td>The Can Read user criteria list for this knowledge base.</td>
</tr>
<tr>
<td>Can Contribute</td>
<td>The Can Contribute user criteria list for this knowledge base.</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Featured Content</td>
<td>List of knowledge articles that appear in the homepage Featured Content section based on the corresponding keyword search set for each article.</td>
</tr>
<tr>
<td>Knowledge Categories</td>
<td>List of knowledge categories associated with this knowledge base.</td>
</tr>
</tbody>
</table>

6. Click Submit.

Knowledge workflows

The publishing and retirement processes for a knowledge article are controlled by workflows defined for the knowledge base that the article belongs to.

You can assign different workflows to each knowledge base.

You can use one of the default workflows, or create your own workflows to define custom publishing and retirement processes for different types of knowledge.

For the workflows that require approval, you can configure which users can approve or reject by editing the getApprovers() function in the KBWorkflow script include.

**Table 549: Default knowledge workflows**

<table>
<thead>
<tr>
<th>Workflow</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge - Approval Publish</td>
<td>Requests approval from a manager of the knowledge base before moving the article to the published state. The workflow is canceled and the article remains in the draft state if any manager rejects the request.</td>
</tr>
<tr>
<td>Knowledge - Approval Retire</td>
<td>Requests approval from a manager of the knowledge base before moving the article to the retired state. The workflow is canceled and the article remains in the published state if any manager rejects the request.</td>
</tr>
<tr>
<td>Knowledge - Instant Publish</td>
<td>Immediately publishes a draft article without requiring an approval.</td>
</tr>
<tr>
<td>Knowledge - Instant Retire</td>
<td>Immediately retires a published article without requiring an approval.</td>
</tr>
<tr>
<td>Knowledge - Publish Knowledge</td>
<td>A subflow that moves the knowledge article to the published state. You can use this subflow when defining your own workflow.</td>
</tr>
<tr>
<td>Knowledge - Retire Knowledge</td>
<td>A subflow that moves the knowledge article to the retired state. You can use this subflow when defining your own workflow.</td>
</tr>
</tbody>
</table>

**Note:** Retired knowledge articles cannot be searched for by external users or customers. To reuse a retired article, create a new article with the same content, which is published once approved.
Knowledge properties

As an administrator, you can configure the look and functionality of many knowledge base features with knowledge properties.

You can access knowledge properties by navigating to Knowledge Administration Properties.

Knowledge portal properties

Knowledge portal properties control the look and functionality of the legacy portal page. This portal page lists recent knowledge articles and their publishing dates, organized by topic.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of columns on Knowledge portal pages. (glide.knowman.columns)</td>
<td>Set the number of columns for arranging topics on the knowledge portal.</td>
</tr>
<tr>
<td>Maximum number of articles per content block on the home page (glide.knowman.content_block_limit)</td>
<td>Enter the maximum number of articles to display in the Most Useful and Most Viewed sections of the knowledge homepage.</td>
</tr>
<tr>
<td>Omit empty Knowledge topics and categories. (glide.knowman.show_only_populated)</td>
<td>Select the Yes check box to display topic sections only if there are articles for the topic. Clear the check box to show all topic sections, even those with no assigned articles.</td>
</tr>
</tbody>
</table>

**Note:** This property applies only to Knowledge v2 pages. This property is not supported on Knowledge v3 pages.

**Note:** This property applies only to the default knowledge base and the legacy knowledge portal. Knowledge v3 articles do not specify a topic. Therefore, this property applies only to Knowledge v2 pages. This property is not supported on Knowledge v3 pages.
<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Show Knowledge section descriptions.</td>
<td>Select the Yes check box to display topic descriptions in the knowledge portal. To enter these descriptions: 1. Edit an existing knowledge article. 2. Right-click the Topic field label and choose Show Choice List. 3. Open the record for the topic name and enter the description into the Hint field. Clear the check box to omit section descriptions from the knowledge portal.</td>
</tr>
<tr>
<td>Number of Knowledge Base items to preview in a section.</td>
<td>Set the maximum number of articles per topic for the knowledge portal. The specific articles shown depends on the Knowledge section sort field property setting. Note: This property applies only to Knowledge v2 pages. This property is not supported on Knowledge v3 pages.</td>
</tr>
<tr>
<td>Knowledge section sort field.</td>
<td>Select the default order for articles within each topic section on the knowledge portal.  • Published: uses the date published.  • View count: uses the number of times articles have been viewed during the period specified in the Number of days used when summing article views property.  • Alphabetically: uses the first letter of the article title (Short description field). Note: This property applies only to Knowledge v2 pages. This property is not supported on Knowledge v3 pages.</td>
</tr>
<tr>
<td>Knowledge Base section sort direction.</td>
<td>Select the order, ascending or descending, in which articles are listed within each topic section on the knowledge portal. The value used for sorting is set in the Knowledge section sort field property. Note: This property applies only to Knowledge v2 pages. This property is not supported on Knowledge v3 pages.</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Show unpublished articles in Knowledge Base portal and topic lists.</td>
<td>Select the Yes check box to allow users to see unpublished articles in the knowledge portal and knowledge search results. Use the subsequent List of roles... properties to designate which users can see articles in various unpublished states. If this is not selected, users with appropriate roles can access unpublished articles through other modules of the Knowledge Base application.</td>
</tr>
<tr>
<td>List of roles (comma separated) that can see articles in the Review workflow state in the Knowledge portal and Topic list.</td>
<td>Enter role names exactly as they appear in User Administration Roles. If Show unpublished articles in Knowledge Base portal and topic lists is selected, users with these roles see articles in the Review workflow state in the knowledge portal, in the topic list that appears when they click a topic title on the portal, and in knowledge search results.</td>
</tr>
<tr>
<td>List of roles (comma separated) that can see articles in the Draft workflow state in the Knowledge portal and Topic list.</td>
<td>Enter role names exactly as they appear in User Administration Roles. If Show unpublished articles in Knowledge Base portal and topic lists is selected, users with these roles see articles in the Draft workflow state in the knowledge portal, in the topic list that appears when they click a topic title on the portal, and in knowledge search results.</td>
</tr>
<tr>
<td>Define roles that can view articles in other/custom workflow states. Do not include Draft and Review states, as they are already defined in other properties.</td>
<td>Enter role names exactly as they appear in User Administration Roles. If Show unpublished articles in Knowledge Base portal and topic lists is selected, define the custom field and role as workflow state: [roles];. The users with these roles see articles in the custom workflow state on the knowledge portal.</td>
</tr>
<tr>
<td>The number of articles that are asynchronously loaded when scrolling down in the new search results page.</td>
<td>Enter the number of articles to be displayed during a search.</td>
</tr>
<tr>
<td>Show only Knowledge topic titles on portal page (no article links).</td>
<td>Select the Yes check box to omit all article titles from the knowledge portal and show only the topic names. Users can click the topic title to see the list of related articles.</td>
</tr>
</tbody>
</table>

**Note:** This property applies only to Knowledge v3 pages. This property is not supported on Knowledge v2 pages.
<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of days (integer, default 30) used when summing article views. Views older than this are not considered when sorting articles based on view count. 0 means consider all views. (glide.knowman.view_age.days)</td>
<td>Enter a number of days to consider when calculating view count. This is used only when the Knowledge section sort field property is set to View count. The view_count field in the knowledge record will be updated periodically to reflect the view count based on this property. Enter 0 to have ServiceNow consider all views, regardless of date.</td>
</tr>
<tr>
<td>Automatically place cursor in Knowledge portal search box. (glide.knowman.portal_search_focus)</td>
<td>Select the Yes check box to have ServiceNow place the cursor in the search field when a user opens the knowledge portal. Clear the check box to have users click in the search field before entering a search term.</td>
</tr>
</tbody>
</table>

**Note:** This property applies only to Knowledge v2 pages. This property is not supported on Knowledge v3 pages.

Knowledge search properties

Knowledge search properties give you control over the search options available to users and the presentation of search results.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
</table>
| Knowledge search result order. (glide.knowman.order.search)           | Select the order for displaying search results:  
  - Number of Views: orders search results based on the Number of days used when summing article views property.  
  - Relevancy: orders search results based on content that is similar to the search term.  
  - Last Modified: orders search results based on modification date.                                                                                      |
| Search method used when searching Knowledge from a task or directly in the Knowledge Base. (glide.knowman.search.operator) | Select the search approach to use when the search term includes multiple words.  
  - OR query: returns articles that contain at least one word from the search term.  
  - AND then OR query: first searches for articles that include all words in the search term (an AND query). If no matches are found, an OR query is performed. |
<p>| Show author in knowledge search results. (glide.knowman.search.show_author) | Select this check box to include the author of each article in knowledge search results. If the article versioning feature is enabled, articles with a version number less than or equal to 1.0 display Authored by &lt;name&gt; and articles with a version number greater than 1.0 display Revised by &lt;name&gt;. |</p>
<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Show last modified date and time in knowledge search results. (glide.knowman.search.show_last_modified)</td>
<td>Select this check box to include the date and time each article was last edited in knowledge search results.</td>
</tr>
<tr>
<td>Show publish date in knowledge search results. (glide.knowman.search.show_published)</td>
<td>Select this check box to include the date each article was published in knowledge search results.</td>
</tr>
<tr>
<td>Show category in knowledge search results. (glide.knowman.search.show_category)</td>
<td>Select this check box to include the category breadcrumbs of each article in knowledge search results.</td>
</tr>
<tr>
<td>Show number of views in knowledge search results. (glide.knowman.search.show_view_count)</td>
<td>Select this check box to include the number of times each article was viewed in knowledge search results.</td>
</tr>
</tbody>
</table>
| How to display attachments in Knowledge Search Results. (glide.knowman.search.attachment) | Select the behavior of how the attachments are shown in the search results:  
  - Do not show attachment  
  - Show only link for attachment  
  - Show attachment with text snippet (default)  
  
  For best performance, select Do not show attachment, or Show only link for attachment. |
| Show relevancy in knowledge search results. (glide.knowman.search.show_relevancy) | Select this check box to show how relevant each search result is based on the search string.  
  Relevancy value is only shown when knowledge search result order property is set to Relevancy. |
| Enable instant search results for knowledge. (glide.knowman.search.instant_results) | Select this check box to enable instant search for search results. The default is No. |
| Show Knowledge Base name in Knowledge search results. (glide.knowman.search.show_knowledgebase) | Select this check box to display the knowledge base to which the knowledge base article belongs. For example, IT. |
| Show average rating from knowledge search results. (glide.knowman.search.show_rating) | Select this check box to display the average star ratings for knowledge base articles. |
| Show article number in knowledge search results. (glide.knowman.search.show_article_number) | Select this check box to display the article number for each article in the search result.  
  If the article versioning feature is enabled, the article number and the version number are displayed for each article in the search result. |

**Note:** This property does not apply to contextual search results.
<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
</table>
| Specify default language for searching articles. (glide.knowman.search.default_language) | Set the property to the desired default language for searching articles.  
  - String  
  - Default value: user-specified  
  - Location: System Properties  
  **Note:** If the glide.knowman.enable_multi_language_search (property is set to True, then the multi-language search capability overrides the default language search capability. |
| Enable multi-language search. (glide.knowman.enable_multi_language_search) | Set the property to True to enable search for multiple languages simultaneously.  
  - Type: true | false  
  - Default value: false  
  - Location: System Properties  
  **Note:** If this property is set to True, it overrides the setting for the glide.knowman.search.default_language property. |
| Maximum character limit for meta description used for SEO. (glide.knowman.seo.pages.meta_description.length) | Set the maximum number of characters used as meta description for SEO.  
  - Type: integer  
  - Default value: 100  
  - Location: System Properties  
  When you change the character limit, the meta description with the updated limit is only applied to articles published after the change was made. To apply the change to all existing published articles, run the Populate Meta Description on KB Articles fix script. |

**Knowledge article view properties**

Article view properties give you control over the meta data and rating options that appear with articles. They also enable you to grant access to individual feedback options based on user role.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Show tasks to which an article has been recently attached. (glide.knowman.recent_tasks.display)</td>
<td>Select the Yes check box to have article view include a list of tasks associated with the article. Knowledge articles can be attached to a task by clicking the Attach to Task button after searching from a form.</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Number of attached tasks to display when viewing an article. (glide.knowman.recent_tasks)</td>
<td>Specify the maximum number of tasks to list in article view.</td>
</tr>
<tr>
<td>Show article rating section, which may optionally include yes/no rating, star rating, and flagging options. (glide.knowman.show_rating_options)</td>
<td>Select the Yes check box to display the rating options for users with specific roles. Clear this check box to omit the rating section for all users, regardless of role. The Feedback field is always displayed for all users.</td>
</tr>
<tr>
<td>List of roles (comma separated) that can see an article's rating section, which may optionally include yes/no rating, star rating, and flagging option. (glide.knowman.show_rating_options.roles)</td>
<td>Enter role names exactly as they appear in User Administration &gt; Roles. If Show article rating section... is selected, users with the roles listed here see the yes/no rating, star rating, and flagging options, according to related property settings. Be sure to include all roles that should be permitted to see any of these rating options. Separate properties enable you to identify specific roles for each option separately. All roles in those properties must also be listed here.</td>
</tr>
<tr>
<td>Show the &quot;Was this article helpful?&quot; yes/no rating option. (glide.knowman.show_yn_rating)</td>
<td>Select the Yes check box to display the &quot;Was this article helpful?&quot; rating to users with roles set in the associated property. This appears only if the Show article rating section... property is selected.</td>
</tr>
<tr>
<td>List of roles (comma separated) that can see yes/no &quot;Was this article helpful?&quot; rating option. (glide.knowman.show_yn_rating.roles)</td>
<td>Enter role names exactly as they appear in User Administration &gt; Roles. If both Show article rating section... and Show the &quot;Was this article helpful?&quot; properties are selected, users with the roles listed here see the &quot;Was this article helpful?&quot; rating in article view. All roles listed here must also be listed in the List of roles that can see an article's rating section... property.</td>
</tr>
<tr>
<td>Show &quot;Create Incident&quot; link. (glide.knowman.create_incident_link.display)</td>
<td>Select the Yes check box to display the Create Incident link after a user rates an article as not helpful.</td>
</tr>
<tr>
<td>URL used for the &quot;Create Incident&quot; link. (glide.knowman.create_incident_link)</td>
<td>Enter the URL for the page where users can create an incident only if the Show &quot;Create Incident&quot; link... property is selected. To find the URL, open the appropriate page, then right-click the header bar and choose Copy URL. Highlight the URL that appears and use the browser's copy and paste feature to place it into this property field.</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Show five-star rating option. (glide.knowman.show_star_rating)</td>
<td>Select the Yes check box to display the five-star rating to users with roles set in the associated property. This appears only if the Show article rating section... property is selected.</td>
</tr>
<tr>
<td>List of roles (comma separated) that can see five-star rating option.</td>
<td>Enter role names exactly as they appear in User Administration &gt; Roles. If both Show article rating section... and Show five-star rating option properties are selected, users with the roles listed here see the five-star rating option in article view. All roles listed here must also be listed in the List of roles that can see an article's rating section... property.</td>
</tr>
<tr>
<td>List of roles (comma separated) that can flag incomplete/inaccurate</td>
<td>Enter role names exactly as they appear in User Administration &gt; Roles. If both Show article rating section... and Show &quot;Flag Article&quot; option properties are selected, users with the roles listed here see the flag article option in article view. All roles listed here must also be listed in the List of roles that can see an article's rating section... property.</td>
</tr>
<tr>
<td>List of roles (comma separated) that can see user comments on an article.</td>
<td>Enter role names exactly as they appear in User Administration &gt; Roles. If the Show user comments on knowledge articles property is selected, users with the roles listed here see user comments in article view.</td>
</tr>
<tr>
<td>Maximum number of user comments displayed on a knowledge article.</td>
<td>Set the maximum number of user comments to display. If no value is set, all comments are displayed. This property does not apply to live feed comments on the article view page.</td>
</tr>
<tr>
<td>Use Live Feed for Knowledge feedback. (glide.knowman.use_live_feed)</td>
<td>Set the property to True to use live feed to manage and display feedback on knowledge articles.</td>
</tr>
</tbody>
</table>
|                                                                         | • Type: true|false  
|                                                                         | • Default value: false  
|                                                                         | • Location: System Properties   |
Knowledge homepage properties

Knowledge homepage properties control the featured content on the knowledge homepage.

Table 550: Table title

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display or hide the count of articles and questions in the Knowledge Homepage. (glide.knowman.show_number_on_homepage)</td>
<td>Select to display or hide the count of knowledge articles and questions on the Knowledge homepage.</td>
</tr>
<tr>
<td>Default keyword for getting pinned articles (glide.knowman.default_keyword)</td>
<td>Enter a default keyword for pinned articles. Articles pinned with the specified keyword appear in the Featured Content section of the knowledge homepage.</td>
</tr>
<tr>
<td>Display or hide the count of articles and questions in the category and child categories (glide.knowman.show_number_on_categories)</td>
<td>Select to display the count of articles and questions within each category, including subcategories, when browsing or searching knowledge bases.</td>
</tr>
<tr>
<td>Show Knowledge Home page when user has access to only one Knowledge Base (glide.knowman.show_home_if_one_kb)</td>
<td>Select to display the Knowledge homepage when the current user has access to only one knowledge base.</td>
</tr>
<tr>
<td>Default header title for the pinned articles section on knowledge home pages. (glide.knowman.default_pinned_section_header_title)</td>
<td>Enter a title for the Featured Content section of the knowledge homepage.</td>
</tr>
</tbody>
</table>

Other knowledge properties

Additional knowledge properties let you control general knowledge management features.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>When attaching an article to an incident, copy the content into this field. (glide.knowman.attach.fields)</td>
<td>When a user searches knowledge from a task form (such as an incident, problem, or change) and clicks the Attach to Task button for an article, the system copies the article number and content into the field specified here. You can specify a separate field for each table you want to attach articles to as a comma-separated list. Use dot walking to copy the article content into related records. If a specified field does not exist, that field is ignored.</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Knowledge Management logo to display if running out of the ServiceNow frames. (glide.knowman.frameless_logo)</td>
<td>Click the reference lookup tool (Figure 288: Icon Reference Lookup) and choose an image file to be displayed on knowledge pages that are used outside of the ServiceNow application frames. For example, the logo image selected here appears if you create a Content Management System site that includes knowledge pages. You can also enter the Name of an image stored in the database to use that image. <strong>Note:</strong> This property applies only to Knowledge v2 pages. This property is not supported on Knowledge v3 pages.</td>
</tr>
<tr>
<td>Hide the 'Import' functionality (button and drag-n-drop) for all users. (glide.knowman.import.hide_import_functionality)</td>
<td>Select Yes to hide the Import Articles button. If you have not yet migrated to Knowledge v3 and are using legacy Knowledge v2, you can configure the visibility of the Import Articles button to prevent users from importing articles to knowledge bases.</td>
</tr>
<tr>
<td>Show publish check box on the knowledge import pop-up. (glide.knowman.import.show_publish_checkbox)</td>
<td>Select No to remove the Publish check box on the knowledge import form so that an article cannot be published as part of the import process. Default is yes.</td>
</tr>
<tr>
<td>Use submission workflow. (glide.knowman.submission.workflow)</td>
<td>Select the Yes check box to use the knowledge submission workflow instead of the standard knowledge workflow. If this option is selected, each time a user creates knowledge from an incident or problem, the content is placed into a submission record instead of a draft article. Transforming knowledge submissions into articles follows a specific workflow.</td>
</tr>
<tr>
<td>The sys_id of the knowledge base when creating knowledge from task records. (glide.knowman.task_kb)</td>
<td>Enter the sys_id of the knowledge base to put new knowledge articles created from tasks in.</td>
</tr>
<tr>
<td>Before displaying an article's text in search results or the article view, check field-level ACLs on appropriate field: kb_knowledge.text (HTML article) or kb_knowledge.wiki (wiki text article). (glide.knowman.text.check_can_read)</td>
<td>Select this check box if users must have ACL-based permission to view text fields on the Knowledge [kb_knowledge] table to read article previews in knowledge search results.</td>
</tr>
</tbody>
</table>

**Knowledge Social Q&A properties**

You can set the limit for the number of times users can ask, answer, or subscribe to Social Q&A questions, or comment on the questions and answers using the Social Q&A system properties.
**Note:** To open the System Properties [sys_properties] table, enter sys_properties.list in the navigation filter.

**Note:** If the Value field for any of the Social Q&A properties is left blank, then a rate limit does not apply for that particular property.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum number of Social Q&amp;A questions that can be posted per user per</td>
<td>Enter the maximum number of times a user can post Social Q&amp;A questions per day.</td>
</tr>
<tr>
<td>day. sn_kb_social_qa.max_questions_per_user_daily</td>
<td>• Type: Integer&lt;br&gt;• Default value: 500&lt;br&gt;• Location: System Properties</td>
</tr>
<tr>
<td>Maximum number of Social Q&amp;A answers that can be posted per user per</td>
<td>Enter the maximum number of times a user can post answers to the Social Q&amp;A questions per day.</td>
</tr>
<tr>
<td>day. sn_kb_social_qa.max_answers_per_user_daily</td>
<td>• Type: Integer&lt;br&gt;• Default value: 500&lt;br&gt;• Location: System Properties</td>
</tr>
<tr>
<td>Maximum number of Social Q&amp;A comments that can be posted per user per</td>
<td>Enter the maximum number of times a user can post comments to the Social Q&amp;A questions or answers per day.</td>
</tr>
<tr>
<td>day. sn_kb_social_qa.max_comments_per_user_daily</td>
<td>• Type: Integer&lt;br&gt;• Default value: 500&lt;br&gt;• Location: System Properties</td>
</tr>
<tr>
<td>Maximum number of times a user can subscribe to Social Q&amp;A questions per</td>
<td>Enter the maximum number of times a user can subscribe to Social Q&amp;A questions per day.</td>
</tr>
<tr>
<td>day. sn_kb_social_qa.max_subscriptions_per_user_daily</td>
<td>• Type: Integer&lt;br&gt;• Default value: 500&lt;br&gt;• Location: System Properties</td>
</tr>
</tbody>
</table>

**Article versioning properties**

The knowledge administrator can set configuration properties that enable users to edit specific fields on published articles without creating new versions.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable article versioning feature. (glide.knowman.versioning.enabled)</td>
<td>Select the Yes check box to enable the article versioning feature.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
</tbody>
</table>
### Property
Enable minor edits to a published article without creating a new version.

(glide.knowman.versioning.enable_minor_edits)

**Description**
Select the Yes check box to enable minor edits to published articles without creating a new version.

- **Type:** true | false
- **Default value:** false
- **Location:** Knowledge Administration Properties

**Note:** This feature is available for the following users: the knowledge administrator, the knowledge base manager, and the knowledge base owner.

### Property
A comma-separated list of fields that can be edited on published articles without creating a new version.

(glide.knowman.versioning.minor_edit_fields)

**Description**
Enter the fields in a comma-separated list that can be edited on published articles without creating a new version.

- **Type:** string
- **Default value:** valid_to
- **Location:** Knowledge Administration Properties

---

### Knowledge subscription properties

The knowledge administrator can set configuration properties that enable users to subscribe to knowledge bases and knowledge articles.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
</table>
| Enable subscribe feature for KM  (glide.knowman.enable_km_subscription) | Select the Yes check box to enable the Knowledge subscription feature.  
- **Type:** true | false  
- **Default value:** true  
- **Location:** Knowledge Administration Properties |

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
</table>
| List of roles (comma-separated) who can have subscription feature (glide.knowman.enable_km_subscription.roles) | Enter the roles in a comma-separated list that can use the Knowledge subscription feature.  
- **Type:** string  
- **Default value:** knowledge  
- **Location:** Knowledge Administration Properties |
London    ServiceNow    Now Platform  Capabilities

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of workflow states (comma-separated) that can have subscription</td>
<td>Enter the workflow states for knowledge articles in a comma-separated list</td>
</tr>
<tr>
<td>feature (glide.knowman.enable_km_subscription.workflow_state)</td>
<td>that users can subscribe to.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: draft, review, published</td>
</tr>
<tr>
<td></td>
<td>• Location: Knowledge Administration Properties</td>
</tr>
</tbody>
</table>

### Article quality index properties

The knowledge administrator can set the pass score for AQI reviews using the knowledge properties page.

**Table 551: Properties for Article Quality Index**

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass score for AQI reviews.</td>
<td>Set the pass score for AQI reviews.</td>
</tr>
<tr>
<td>glide.knowman.aqi_pass_score</td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 70</td>
</tr>
<tr>
<td></td>
<td>• Range of values possible: 1-100</td>
</tr>
<tr>
<td></td>
<td>List of article workflow states to perform AQI reviews.</td>
</tr>
<tr>
<td>glide.knowman.aqi_article_workflow_states</td>
<td>Enter the article workflow states, in a comma-separated list, where users</td>
</tr>
<tr>
<td></td>
<td>can perform AQI reviews.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: draft, review, published</td>
</tr>
</tbody>
</table>

### External Content Integration Properties

Administrators can configure the properties to add allowed content types and change the UI label for the external content integration feature.

**Table 552: Properties for External Content Integration**

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum limit for total size of external content in Knowledge Management</td>
<td>• Type: integer</td>
</tr>
<tr>
<td>(in GB).</td>
<td>• Default value: 2</td>
</tr>
<tr>
<td>sn_km_intg.glide.knowman.external.max_content_size</td>
<td><strong>Note:</strong> This is a read-only field.</td>
</tr>
<tr>
<td></td>
<td>Maximum size of an external article including its attachments (in MB).</td>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 8</td>
</tr>
<tr>
<td>sn_km_intg.glide.knowman.external.max_article_size</td>
<td><strong>Note:</strong> This is a read-only field.</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| An editable, comma-separated list of allowed content types to be processed from the source system. | - Type: comma separated values  
- Default value: application/msword,application/vnd.openxmlformats-officedocument.wordprocessingml.document,application/vnd.ms-excel,application/vnd.openxmlformats-officedocument.spreadsheetml.sheet,application/vnd.ms-powerpoint,application/vnd.openxmlformats-officedocument.presentationml.presentation,application/pdf,text/plain,text/html,image/gif,image/jpeg,image/png  
- Other possible values: application/xml, video/mp4, audio/mpeg |
| List of content types not allowed to be processed from the source system. | - Type: comma separated values  
- Default value: application/octet-stream,application/x-apple-diskimage,application/vnd.microsoft.portable-executable |
| UI Label for indicating external articles in Search Results and Article View Pages. | - Type: string  
- Default value: External Content |

### Actionable Knowledge Feedback Properties

The Knowledge administrator can set configuration properties that would create actionable feedback tasks.

#### Table 553: Properties for Actionable Knowledge Feedback

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
</table>
| Create actionable feedback task when an article is marked as not helpful. | Select the Yes check box to enable actionable feedback task generation when an article is marked as not helpful.  
- Type: true|false  
- Default value: false  
- Location: Knowledge Administration Properties |
Create actionable feedback task when an article is rated at or lower than this value. 0 or no value indicates that actionable feedback tasks are not enabled for Rating type feedback.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(glide.knowman.feedback.enable_actionable_feedback_for_rating)</td>
<td>An actionable feedback task is created when an article is rated at or lower than this value. The article is rated on a scale of 1-5.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default Value: none</td>
</tr>
<tr>
<td></td>
<td>• Location: Knowledge Administration Properties</td>
</tr>
</tbody>
</table>

Create a custom knowledge homepage

As a system administrator, you can create a module allowing users to open a knowledge homepage for a specific knowledge base or category.

Role required: admin

1. Right-click the application label in the application navigator and select Edit Application.
2. In the Modules related list click New.
3. Enter a Title for the module.
4. In the Link type field, select URL (from Arguments).
5. In the Arguments field, append one or more of the following values to $knowledge.do#/search?.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sysparm_kb=&lt;knowledge base sys_id&gt;</td>
<td>Enter the sys_id of a knowledge base to show knowledge articles from that knowledge base by default.</td>
</tr>
<tr>
<td></td>
<td>If the specified knowledge base does not exist, the default knowledge homepage appears when accessing the custom homepage module.</td>
</tr>
<tr>
<td>sysparm_category=&lt;knowledge category sys_id&gt;</td>
<td>Enter the sys_id of a knowledge category to show knowledge articles from that category by default.</td>
</tr>
<tr>
<td></td>
<td>If the specified category does not exist, the default category for the selected knowledge base appears when accessing the custom homepage module.</td>
</tr>
<tr>
<td>sysparm_order=&lt;view_count, last_modified, or relevancy&gt;</td>
<td>Enter the default sort order for articles to appear in.</td>
</tr>
</tbody>
</table>

Note: The category passed in this parameter must belong to the knowledge base passed in the sysparm_kb parameter.

To create a homepage for a Facilities knowledge base with a sys_id of d582764047022100158b949b6c9a7145 and sorting by last modified date, enter $knowledge.do#/search?
sysparm_kb=d582764047022100158b949b6c9a7145&sysparm_order=last_modified in the Arguments field on the Module form.

I18N - Knowledge internationalization

Organizations with knowledge users who speak multiple languages can activate the optional knowledge internationalization features.

Activating internationalization plugins for any of the available languages automatically activates the I18N: Knowledge Management Internationalization Plugin v2 plugin (com.glideapp.knowledge.i18n2).

When active, knowledge internationalization enables the knowledge management team to create language-specific knowledge articles and keep translations of the same article related to each other so they are easy to manage. Users can view and search within their own language while still being able to view articles in other languages when necessary.

**Note:**

To set the default language for searching articles to a language different from the logged in language of the user, specify the desired language in the glide.knowman.search.default_language system property. For example, if you are logged in using the French language and would like the default language for searched articles to be English, specify English in the system property. You can then switch to French from within the UI to see French articles. If no language is specified in the system property, articles default to the logged in language of the user.

Refer to Knowledge search on page 1382 for information on performing a search on all available languages simultaneously.

Social Q&A does not use language-specific questions and answers. All questions and answers appear in the language they were created in. For example, a question in English is not translated when the current user's selected language is French.

Activate the knowledge management internationalization plugin

To enable translation of knowledge articles, you must activate multiple plugins.

- I18N:Knowledge Management Internationalization v2 plugin
- Internationalization plugins for each appropriate language

**Activate a plugin**

**Installed Components**

Activating the Knowledge Management Internationalization plugin installs these components:

- A relationship named Translated Versions that creates a related list on the Knowledge form showing other articles that have the same parent article.
- A business rule named knowledge query that automatically filters the knowledge portal and search results based on the user's selected language.
- A UI macro named kb_languages.
- Two fields, named Language and Parent, in the Knowledge [kb_knowledge] table and the Knowledge form.
Knowledge Form Changes

Activating knowledge management internationalization adds these fields to the Knowledge form.

- **Language**: select the language for the article.
- **Parent**: enter the number of the article that represents the base language. This setting keeps translations of the same article related to each other. Consider choosing the same language consistently for the parent article.

Additionally, the Translated Versions related list is automatically added to the Knowledge form after you save an article.

Create a translation for a knowledge article

Create a translation for an article from the Translated Versions related list on the knowledge article record. Before creating a translation, activate the internationalization plugin for the desired language which, in turn, activates the I18N: Knowledge Management Internationalization Plugin v2 (com.glideapp.knowledge.i18n2).

1. Open the knowledge article record.
2. In the Translated Versions related list, click New.
3. Select the desired language for the translation in the Language field.
4. Provide a description in the Short Description field.
5. Click Submit.

The translation is created and added to the Translated Versions related list.

Duplicate knowledge article numbers

Importing knowledge articles into an instance can create articles with duplicate numbers.

The Knowledge Number field is auto-generated and is incremented every time you create a new article in an instance. The initial value for the Number field is 10,000. To customize this number:

1. Navigate to System Definition Number Maintenance.
2. Search for Knowledge in the Table column.
3. Click the Controls related list tab.
4. Enter a new Number and click Update.

Importing knowledge articles from another instance or as part of the demo data for another application may introduce an article with a number that is already in use. Because the Knowledge Number field is not uniquely indexed, the import completes without error.

With duplicate knowledge article numbers present, links to article view pages that use the knowledge number can behave inconsistently. For example, if there are two articles with the same Knowledge number KB0000033, the following link may open either of these two articles randomly: kb_view.do?sysparm_article=KB0000033. This can happen in Knowledge search results where clicking on a result opens a different article instead of the article displayed in the search results.
Avoiding duplicate Knowledge article numbers

To avoid inserting Knowledge articles with duplicate numbers into a production environment:

- Do not import demo data articles in production environment.
- Verify the numbers of the articles to be inserted to make sure they are not already in use.
- Create a before insert business rule on the Knowledge table (kb_knowledge) to ensure the new number is not already in use.

You can also update the initial value for the Knowledge Number field so that newly created articles do not conflict with existing articles.

1. Navigate to System Definition Number Maintenance.
2. Search for Knowledge in the Table column.
3. Click the Knowledge link to open the Knowledge table form.
4. Click the Controls related list tab.
5. In the Number field, update the count to a number greater than the largest value already in the system.
6. Click Update.

Enable search on all knowledge bases

Configure the knowledge base search source in the service portal to perform a search on all knowledge bases.

Role required: admin

By default, the knowledge base search source in the service portal is set to search only a single knowledge base, which by default is set to the IT knowledge base.

1. Navigate to Service Portal Portals Service Portal.
2. Clear the entry in the Knowledge base field.
3. Click Update.
4. In the Search Source related list, select Knowledge Base.
5. In the Data Source tab, go to the Data fetch script field and delete or comment out line 7.
```javascript
(function(query) {
  var results = [];
  // Here goes the logic. Compute results however you want!
  var kb = new GlideRecord('kb_knowledge');
  kb.addQuery('workflow_state', 'published');
  kb.addQuery('valid_to', '>=', (new GlideDate()).getLocalDate().getValue());
  kb.addQuery('kb_knowledge_base', sp.getValue('kb_knowledge_base'));
  kb.query();
  data.article_count = kb.getRowCount();

  var kbCount = 0;
  while (kb.next() && kbCount < data.limit) {
    // Does user have permission to see this item?
    if (!sp.canReadRecord('kb_knowledge', kb.getUniqueValue()))
      continue;

    var article = {};
    $sp.getRecordDisplayValues(article, kb,
      'sys_id, number, short_description, published, text');
    article.publishedUTC = kb.getValue('published');
    article.type = "kb";
    if (article.text)
      article.text = ";
    article.text = $sp.stripHTML(article.text) + "";
```

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6. Click Update.
   When you perform a keyword search in the service portal, the knowledge base search source
   performs the search on all knowledge bases.

Enable creating an article from a customer service case

You can enable authors to reuse information in a case by copying case details into an article template. Use
the pre-defined customer service source case table to article template target table configuration or create
custom configurations between the two tables to copy information from a case to an article.

- The Knowledge Management Advanced plugin must be active.
- The KCS for Customer Services Management property must be enabled
- The pre-defined KCS article template or a newly created article template must be active.

Note: You can do one of the following to create an article from a case:

- Use the pre-defined Case KCS Article mapping as is or modify the field mappings between the case
  source table and article template target table.
- Create a new article template target table and map it to the case source table and customize the
  field mappings between them. For information on creating article templates, refer to Create an article
  template.
- Knowledge users use the Create Knowledge button in a case form to create an article from a case and
  must have "can contribute" permission for at least one active knowledge base to create an article from a
  case. For information on user permissions, see Knowledge Management roles.

Role required: sn_customerservice.customer_admin or admin

The pre-defined Case KCS Article mapping is stored in the CSM Table Map [csm_table_map] table. This configuration has the sn_customerservice_case source case table configured to the kb_template_kcs_article target article template table with the four field mappings pre-configured between the tables. You can customize the existing field mappings or map additional fields between the tables.

1. In the application filter navigator, type csm_table_map.list.
2. Click Case KCS Article.
3. From the Target Table list, use the pre-defined KCS article template table or select the newly created
   article template table.
4. Map each customer service case field that must be used to create knowledge articles.
   a) In the Basic Field Mapping related list, click New.
      To map fields, fill in the following fields:

```plaintext
Table 554: Customer service case table to article template target table field mapping

<table>
<thead>
<tr>
<th>Field</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source Field</td>
<td>Select the field in the source case table that contains the information to be copied to the field in the article template target table.</td>
</tr>
</tbody>
</table>
```
b) Click Submit.

c) To map fields using advanced scripts, select the Advanced Field Mapping check box and then map the fields between the source and the target table using advanced scripts in the Advanced Field Mapping tab.

**Note:**
If the same source or target field is configured in both the basic and advanced field mappings, the advanced field mapping overrides the basic field mapping.

If the fields configured in the basic and advanced field mapping are different, the field configurations in the advanced field mapping are appended to the field configurations in the basic field mapping.

d) To customize when and how the Create Knowledge button is displayed, use the condition builder in the Condition tab or select Use Advanced Condition check box and configure using advanced scripts.

**Note:** If you change the target table in the Case KCS Article mapping, also update the scripts with the configuration changes for display of this button.

5. Click Update.

**Use knowledge on mobile devices**

All users can access knowledge from mobile devices to search for and view knowledge articles and social Q&A questions.

**Browse knowledge on mobile devices**

You can browse knowledge bases using a mobile device.

Navigate to SELF-SERVICE Knowledge Base.
<table>
<thead>
<tr>
<th>Knowledge Base</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topics</td>
</tr>
<tr>
<td>General</td>
</tr>
<tr>
<td>Desktop</td>
</tr>
<tr>
<td>Applications</td>
</tr>
<tr>
<td>Email</td>
</tr>
<tr>
<td>Policies</td>
</tr>
<tr>
<td>FAQ</td>
</tr>
<tr>
<td>News</td>
</tr>
</tbody>
</table>

**Figure 289: Mobile Knowledge View**

Browse Knowledge by tapping on a category and browsing articles or subcategories.
Figure 290: Mobile Knowledge Categories

**Note:** Select the desired category and click the close icon (×) for the selected category to reflect in the search results.

View knowledge articles and questions on mobile devices

You can read knowledge content using a mobile device.

Tap a title to view the article or question.
Note: You cannot edit or add comments to knowledge articles on the mobile interface. If using *Social Q&A* on page 1388, you can perform all functions such as adding and editing questions, answers, and comments through the mobile interface.

Figure 291: Mobile Knowledge Article View

Search knowledge on mobile devices

Find a specific article or question by searching on a particular term.
Knowledge management has significantly changed with the introduction of knowledge v3 starting with the Fuji release.

Knowledge v3 has several key differences from knowledge v2, the version of knowledge management that was available until Eureka release. The knowledge v3 plugin is activated by default starting with the Fuji release.

The following podcast provides more information on what is new in Knowledge Management v3.

When upgrading from Eureka or earlier versions, if you intend to use the new features available in knowledge v3, you have to migrate legacy knowledge content and any customizations you have made to the Knowledge Base applications.

The following video provides more information on how to migrate from Knowledge Management v2 to v3.
### Table 555: Key differences

<table>
<thead>
<tr>
<th>Legacy Knowledge</th>
<th>Knowledge v3</th>
</tr>
</thead>
<tbody>
<tr>
<td>One knowledge base.</td>
<td>Multiple knowledge bases.</td>
</tr>
<tr>
<td>A single lifecycle workflow shared by all articles.</td>
<td>Separate, customizable workflows available for each knowledge base.</td>
</tr>
<tr>
<td>Two-level organizational structure with Topic and Category. A single organizational taxonomy shared by all articles.</td>
<td>Category structure with any number of levels. Each knowledge base has a unique category taxonomy.</td>
</tr>
<tr>
<td>Permissions defined per article using roles and ACLs.</td>
<td>Permissions defined per knowledge base or article using user criteria.</td>
</tr>
</tbody>
</table>

### Knowledge Management v3 migration process

When you upgrade from Eureka or earlier, consider a multi-step migration process. This process ensures you can access existing knowledge content and allows you to fully migrate at your own pace.

Review automatic changes before upgrading. These changes are applied immediately when upgrading and may impact existing functionality.

1. Migrate knowledge functionality to use your customized functionality with the knowledge v3 enhancements.
2. Migrate knowledge content to use the knowledge v3 enhancements with your existing knowledge articles.

### After migration to Knowledge v3

These items are relevant to getting the full range of new functionality after you migrate.

- You must configure knowledge access controls based on user criteria to ensure that users can access existing knowledge content. Since access control in knowledge v3 is intended to be based on user criteria alone, users may be unable to access v2 or v3 knowledge articles, or have restricted access, with preexisting ACLs.
- If the home page was customized in knowledge v2, custom layout and links are not saved in knowledge v3.
- Images added using the Image field in a knowledge article form do not display in the Knowledge v3 or Knowledge Service Portal pages. The article search results page displays the knowledge base icon next to all articles from the knowledge base.

### Automatic changes after KMv3 migration

Upgrading to Knowledge v3 automatically changes knowledge functionality including the knowledge user interface and security model.

### Default knowledge base

When you upgrade from Eureka or earlier, a default knowledge base is created, titled Knowledge, that contains all knowledge articles from the previous version.

After the upgrade, you can add and edit articles in this knowledge base.
Articles in the default knowledge base continue to use legacy functionality, such as role-based access controls. Any customizations you made to knowledge functionality before the upgrade are preserved in the default knowledge base.

**Knowledge search changes**

By default, the legacy knowledge portal uses knowledge v3 search with limited filtering options. You can filter results only by knowledge base. Search results include only those articles the current user can view based on user criteria. ACLs do not restrict search results.

**Knowledge security changes**

Knowledge v3 manages access to articles with user criteria rather than roles and ACLs. Existing ACLs on the Knowledge [kb_knowledge] table are preserved, but with the following changes.

- A version of 3 indicates that a knowledge base uses the knowledge v3 functionality.
- A version of 2 indicates that a knowledge base uses legacy functionality.

New ACLs introduced by knowledge v3, such as field-level controls, apply to all knowledge bases.

When you upgrade from Eureka or earlier, any custom ACLs you implemented for the Knowledge table still apply to any knowledge records in the default knowledge base. Knowledge v3 updates ACLs that exist before upgrade so they only apply to Knowledge [kb_knowledge] records where this field value is 2.

**Note:** These changes affect the default knowledge base. Even if you are not using the new knowledge functionality, the legacy knowledge behavior may change if you have made customizations to ACLs on the Knowledge [kb_knowledge] table. Ensure you configure knowledge access controls after upgrading to prevent unexpected behavior.

Because Knowledge v3 introduces ACLs for the Knowledge [kb_knowledge] table, if you do not have high security enabled, you may notice differences in default behavior. See [KB0549970](#) for information about configuring Knowledge v3 without high security.

**Knowledge article view changes**

The Knowledge application uses the kb_view UI page to display knowledge articles.

**UI page**

The following changes apply automatically when you upgrade from Eureka or earlier:

- The existing kb_view page is renamed to kb_view_customer. The kb_view_customer page is used to display articles in the default knowledge base, preserving the legacy user experience.
- A new kb_view page is used. This is becomes the primary page used to display articles that are not in the default knowledge base.

You should review all customizations introduced around the legacy kb_view UI page.

- URLs should not be updated as the new kb_view page redirects to the correct page depending on the article.
- Customizations made to the kb_view UI page are automatically copied to the kb_view_customer page on upgrade.
- Other customizations that affect kb_view may need to be copied or modified to apply to kb_view_customer. For example, an ACL defined for kb_view may need to be duplicated to provide security coverage for kb_view_customer.
Feedback

Legacy feedback functionality is retained for knowledge articles displayed in the legacy article view. Users can continue to use the feedback options to view, add, and reply to comments on these legacy articles. Legacy comments are retained in the Knowledge Feedback [kb_feedback] table.

To retain the legacy comment functionality with new knowledge articles, set the Use Live Feed for Knowledge feedback property (glide.knowman.use_live_feed) to false. This property is set to false by default.

Knowledge portal changes

While the legacy knowledge portal, kb_home, has not changed in Knowledge v3, we strongly recommend that you consider moving to the new Knowledge v3 home page, $knowledge.do.

UI page

You can search articles from the knowledge portal and filter search results by knowledge base, and by language if the instance uses knowledge management internationalization. This portal also appears for users on older browsers, such as Internet Explorer 9, instead of the knowledge homepage.

Navigation add-ons are available in the legacy knowledge portal. Navigation add-ons of the Link type appear in the top-right of the portal. To add navigation add-ons of the Search type, you must customize the kb_home UI page.

Search

By default, the legacy knowledge portal uses knowledge v3 search with limited filtering options. You can filter results only by knowledge base. Search results include only those articles the current user can view.

Access a knowledge base or search engine

You can add new search engines to the advanced search function or add links at the top of knowledge pages.

Role required: admin

This feature lets you configure access to a knowledge base, either public or private, or to a public search engine.

1. Navigate to Knowledge Administration Navigation Add-ons.
2. Click New.
3. Complete the form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter the search engine name or link text.</td>
</tr>
<tr>
<td>Type</td>
<td>Select Search or Link.</td>
</tr>
<tr>
<td>Order</td>
<td>Enter a number to indicate the sequence of this search option or link.</td>
</tr>
<tr>
<td>URL</td>
<td>For a link, enter the URL. Leave blank for a search engine.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
</tr>
<tr>
<td>Script</td>
<td>For a search engine, enter a script that opens the search engine's results page for the search text. Leave blank for a link.</td>
</tr>
</tbody>
</table>

4. Click Submit.

Knowledge submissions

Knowledge submissions created from tasks continue to work in knowledge v3 with minor changes.

By default, the Topic and Category fields no longer appear on the Submission form due to the knowledge v3 category changes.

The property glide.knowman.submission.workflow no longer appears on the knowledge properties UI page. To enable knowledge submissions, set this property to true on the System Properties [sys_properties] table.

See creating knowledge from incidents and problems for instructions on using knowledge submission in knowledge v3.

Migrating Knowledge access controls

Access to knowledge articles is controlled based on the user criteria for the knowledge base.

**Important:** If you do not migrate existing knowledge ACLs to user criteria, users may be unable to access knowledge articles, or may be able to access restricted articles.

User criteria records, rather than ACLs, control basic create, read, update, and delete operations for knowledge articles as well as which search results appear. This may lead to unexpected behavior if your configuration depends on ACLs to control access.

To ensure users are able to access the correct knowledge articles, migrate any ACL-based security settings to user criteria. This process may include creating additional knowledge bases and moving existing content to these knowledge bases, depending on your security model. For a detailed explanation and migration examples, refer to *KB0550924 Understanding User Criteria and ACLs in Knowledge v3*.

This video demonstrates how to manage article-level access controls during migration from Knowledge Management v2 to v3.

Knowledge functionality migration

You can migrate knowledge functionality to use your customized functionality with the knowledge v3 enhancements.

Replaced knowledge modules

When you are ready to migrate to knowledge v3, you can activate the v3 modules and deactivate the legacy modules.

Use the tables below to identify which knowledge v3 modules to activate and which legacy modules to deactivate. When activating a knowledge v3 module, deactivate the knowledge v2 module with the same name to ensure users access the correct module.

You can use the *enablev3anddisablev2menus.txt* backup script to enable knowledge v3 menus and disable knowledge v2 menus.
### Table 557: Knowledge v3 modules

<table>
<thead>
<tr>
<th>Title</th>
<th>Order</th>
<th>Link type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homepage</td>
<td>100</td>
<td>URL (from Arguments:)</td>
</tr>
<tr>
<td>Articles</td>
<td>200</td>
<td>Separator</td>
</tr>
<tr>
<td>Create New</td>
<td>300</td>
<td>New Record</td>
</tr>
<tr>
<td>Unpublished</td>
<td>400</td>
<td>List of Records</td>
</tr>
<tr>
<td>Published</td>
<td>500</td>
<td>List of Records</td>
</tr>
<tr>
<td>Retired</td>
<td>600</td>
<td>List of Records</td>
</tr>
<tr>
<td>Flagged</td>
<td>800</td>
<td>List of Records</td>
</tr>
<tr>
<td>All</td>
<td>900</td>
<td>List of Records</td>
</tr>
<tr>
<td>Open Submissions</td>
<td>960</td>
<td>List of Records</td>
</tr>
<tr>
<td>Administration</td>
<td>1000</td>
<td>Separator</td>
</tr>
<tr>
<td>Knowledge Bases</td>
<td>1100</td>
<td>List of Records</td>
</tr>
<tr>
<td>Feedback</td>
<td>1300</td>
<td>List of Records</td>
</tr>
<tr>
<td>Ratings</td>
<td>1500</td>
<td>List of Records</td>
</tr>
<tr>
<td>Search Log</td>
<td>1600</td>
<td>List of Records</td>
</tr>
<tr>
<td>Navigation Add-ons</td>
<td>1700</td>
<td>List of Records</td>
</tr>
<tr>
<td>Messages</td>
<td>1800</td>
<td>List of Records</td>
</tr>
<tr>
<td>Properties</td>
<td>1900</td>
<td>URL (from Arguments:)</td>
</tr>
<tr>
<td>Overview</td>
<td>2000</td>
<td>URL (from Arguments:)</td>
</tr>
<tr>
<td>User Criteria</td>
<td>2100</td>
<td>List of Records</td>
</tr>
</tbody>
</table>

### Table 558: Legacy modules

<table>
<thead>
<tr>
<th>Title</th>
<th>Order</th>
<th>Link type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create New</td>
<td>100</td>
<td>New Record</td>
</tr>
<tr>
<td>Published</td>
<td>190</td>
<td>List of Records</td>
</tr>
<tr>
<td>Edit</td>
<td>200</td>
<td>List of Records</td>
</tr>
<tr>
<td>Retired</td>
<td>240</td>
<td>List of Records</td>
</tr>
<tr>
<td>Feedback</td>
<td>300</td>
<td>List of Records</td>
</tr>
<tr>
<td>View</td>
<td>400</td>
<td>URL (from Arguments:)</td>
</tr>
<tr>
<td>Submissions</td>
<td>410</td>
<td>Separator</td>
</tr>
<tr>
<td>Assigned to me</td>
<td>420</td>
<td>List of Records</td>
</tr>
<tr>
<td>Open Submissions</td>
<td>450</td>
<td>List of Records</td>
</tr>
<tr>
<td>KCS</td>
<td>460</td>
<td>List of Records</td>
</tr>
<tr>
<td>Flagged Articles</td>
<td>470</td>
<td>List of Records</td>
</tr>
<tr>
<td>Title</td>
<td>Order</td>
<td>Link type</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------</td>
<td>------------------</td>
</tr>
<tr>
<td>Ratings</td>
<td>480</td>
<td>List of Records</td>
</tr>
<tr>
<td>Searching Log</td>
<td>495</td>
<td>List of Records</td>
</tr>
<tr>
<td>Overview</td>
<td>496</td>
<td>URL (from Arguments:)</td>
</tr>
<tr>
<td>Administration</td>
<td>500</td>
<td>Separator</td>
</tr>
<tr>
<td>Navigation Add-ons</td>
<td>600</td>
<td>List of Records</td>
</tr>
<tr>
<td>Properties</td>
<td>700</td>
<td>URL (from Arguments:)</td>
</tr>
<tr>
<td>Messages</td>
<td>800</td>
<td>List of Records</td>
</tr>
</tbody>
</table>

**Knowledge article publish and retire workflows**

With knowledge v3, article state is controlled by workflows.

In the legacy knowledge base, article state was controlled by UI actions. UI actions from previous versions are available only in the default knowledge base.

To preserve your article publishing and retirement process in new knowledge bases, create workflows that follow these processes. To create these workflows, copy the default workflow that best matches your process and modify that copy. After creating workflows that use your article publishing and retirement processes, use these workflows as the Publish workflow and Retire workflow for the new knowledge bases.

**Knowledge article category structure**

With knowledge v3, all knowledge articles are organized by category and subcategory within knowledge bases.

The default knowledge base uses the legacy category structure; knowledge articles are organized by topics and categories.

Before you migrate articles, create a category structure for these articles in the destination knowledge bases. This structure can reproduce your legacy topic and category structure or can be extended to take advantage of the knowledge v3 category functionality.

**Knowledge content migration**

To use the new functionality available in knowledge v3 with legacy articles, you must migrate these articles out of the default knowledge base.

To migrate knowledge content, move articles out of the default knowledge base by changing the Knowledge Base value for each article. The state of the article remains unchanged when moving articles. After selecting a new knowledge base, assign a category to each article using the category structure defined in the new knowledge base.

After you migrate a knowledge article, the legacy feedback functionality is automatically replaced with the new knowledge feedback mechanisms. Legacy feedback is copied to the Live Feed Message [live_message] table to ensure previously submitted feedback is available for knowledge v3 articles.

**Out-of-the-box Knowledge Management Performance Analytics Solutions**

Performance Analytics Solutions contain preconfigured best practice dashboards. These dashboards contain actionable data visualizations that help you improve your business processes and practices.
**Note:** You can activate Performance Analytics solutions and in-form analytics on instances that have not licensed Performance Analytics to evaluate the functionality. However, to start collecting data you must license Performance Analytics.

**Performance Analytics Solutions**

Use the Performance Analytics widgets on the dashboard to visualize data over time, analyze your business processes, and identify areas of improvement. With solutions, you can get value from Performance Analytics for your application with minimal setup.

**Note:** Solutions include some dashboards that are inactive by default. You can activate these dashboards to make them visible to end users according to your business needs.

To enable the solution for Knowledge Management, an admin can navigate to Performance Analytics Guided Setup. Click Get Started then scroll to the section for Knowledge Management. The guided setup takes you through the entire setup and configuration process.

**Article versioning**

Use the Knowledge Management article versioning feature to create and maintain multiple versions of a knowledge article.

Knowledge contributors can create a new version of a knowledge article from an existing published version. This existing version can be either the latest published version or an older outdated version. All changes are stored in the new version of the article and the information in the existing article remains the same.

Activate the Knowledge Management Advanced plugin (com.snc.knowledge_advanced) to use the knowledge subscription feature.

If you import published knowledge articles from a ServiceNow instance that does not support article versioning, you must run the Initialize Versions on Articles fix script to enable article checkout and editing.

With the article versioning feature, knowledge users can:

- Check out the latest version of a published article and create a new version.
- Select a previously published (outdated) version of an article and make it current.
- Recall an article that is being reviewed.
- Retire the latest published version of an article.

There are two types of article revisions: major and minor. Minor revisions include updates to an article that has not yet been published. Major revisions include updates to an article that has been published and is available to customers. To track the different revisions, the article versioning feature introduces version numbering.

With the article versioning feature, the knowledge article number also includes the version number. All references to knowledge articles use this number format. For example, KB0010003 v2.0.

**Manually update customized files**

If you have customized any of the files that are updated as part of the Knowledge Management Advanced Installer plugin, these files are skipped during plugin activation and must be updated manually.

Manually update your customization to include the article versioning-related changes.
• Add the Version field to the Knowledge form layout and the Knowledge list view, if it is not already present.
• Add the outdated choice to the Workflow choice list field on the Knowledge form, if it is not already present. Keep the value as outdated because of dependencies that article versioning functionalities have on this choice.
• Update the Knowledge My Flagged and Self-Service My Knowledge Articles modules to include the following condition in the Filter field, if these modules do not already reflect this change: Revised by is (dynamic) me.

If you have customized any of the Knowledge Management Overview dashboard reports, these files are also skipped during plugin activation and must be updated manually.

**Article versioning changes**

Article versioning introduces new actions that allow knowledge users to create and revise versions of existing articles. It also introduces new fields and related lists to the Knowledge form, new columns to the Knowledge list, and updates to Knowledge dashboard reports.

**New user actions**

As part of creating article versions, users can:
• Check out a published article and create a new version by clicking Checkout on the Knowledge form.
• Recall an article that is being reviewed by clicking Recall on the Knowledge form.
• Select a previously published article in the Outdated state and make it the current published version by clicking Make this current in the Knowledge form header.

---

**Note:** To edit a published article without having to create a new version, make sure the glide.knowman.versioning.enable_minor_edits property is enabled.

**Changes to the Knowledge list**

The article versioning feature adds the following to the Knowledge list:
• The Version column displays the article version number. The Knowledge list displays multiple versions of an article.
• The Workflow column includes the new Outdated state.

**Changes to the Knowledge form**

The article versioning feature adds the following to the Knowledge form:
• The Version field displays the article version number.
• The Display number field displays a combination of the article number and the version number. For example, KB0010004 v1.02. All references to a knowledge article use this display number.
• The Base Version field displays the knowledge article number and version on which the current article is based.
• The Revised By field displays the name of the user who checked out a published article and created a new version.
• The Article Versions related list displays a list of all versions for an article. From this list, you can:
• Click the Version to view a specific version of an article.
• Click the View Article related link to see the article page view.

**Note:** If necessary, configure the form to display the fields and the related list.

**Changes to Knowledge modules**

The article versioning feature introduces the following Knowledge module changes:

• **My Knowledge Articles**
  • For a knowledge user, this module includes records for the articles authored by the user as well as records for each article revised by the user.
  • For a knowledge reviser, this module includes records for the articles published by the user as well as records for each article revised by the user.

• **My Flagged**
  • For a knowledge user, this module includes records for each revision made to articles authored by the user.
  • For a knowledge reviser, this module includes records for each article revised by the user.

**Note:** Users that have customized these modules do not see these changes.

**Changes to Knowledge Management dashboard reports**

The Knowledge Management Overview dashboard reports have been updated to include article versioning-related changes when the Knowledge Management Advanced plugin is activated.

• Articles Flagged in the Last 30 Days
• Articles Marked Not Useful in the Last 30 Days
• Articles Used per Month
• Knowledge use
• Knowledge view
• Knowledge updated in past 30 days
• Knowledge flagged in past 30 days
• Knowledge by Workflow state
• Knowledge created by Author
• Knowledge created in past 30 days
• New Knowledge Articles Created in the Last 30 Days
• Knowledge Ratings for past 30 days

**Versioning information available in the Knowledge Management Service Portal**

Knowledge search results show the article number and the version number for each article.

**Note:**
To display the article version number next to the article number in the search results, enable the glide.knowman.search.show_article_number property in the Knowledge Search Properties section of the Knowledge Management Properties page.

If you are accessing an article from the base system or knowledge service portals using the URL to a KB article, you must also include the article version number in the URL. For example, to access the KB0000005 knowledge article, instead of using the https://<instance name>/sp?id=kb_article&sys_id=KB0000005 as the URL, you must use https://<instance name>/sp?id=kb_article&sys_id=KB0000005%20V1.0 to view the article.

The article view page shows a version history section for articles that have been updated. This section includes the version numbers, date updated, and the name of the author or reviser.

- Click Latest version or the version number and current state to expand the version history section.
- Click the version number to open that particular version of the article.
- When viewing an outdated article, a message informs the user that a newer updated version is available. The message includes a link to the latest version.

Feedback on article versions

With the article versioning feature, users can view and contribute to feedback on the current versions of knowledge articles.

For more information about feedback options, see Knowledge feedback.

<table>
<thead>
<tr>
<th>Feedback option</th>
<th>How this option works with article versioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rating an article</td>
<td>The average rating for an article is carried over to the checked out version. The average rating calculation updates and displays on the current version of the article.</td>
</tr>
<tr>
<td>Marking an article as helpful</td>
<td>The helpfulness percentage of a previous version of an article is also considered for a new version when displayed in the helpfulness column on the homepage.</td>
</tr>
<tr>
<td>Comments</td>
<td>The Comments section at the bottom of an article displays comments from previous versions unless Live Feed is enabled. Live Feed only shows comments for the current version.</td>
</tr>
<tr>
<td>Flagging an article</td>
<td>Checking out an article or setting a previous version to the current version resets the flagged value to false.</td>
</tr>
<tr>
<td>View count</td>
<td>The view count is carried over to the checked out article. Any view of a version of an article increments the view count of all subsequent versions. Views to a newer version of an article do not affect the view count of previous versions.</td>
</tr>
<tr>
<td>Use count</td>
<td>The use count is carried over to the checked out article. Any view of a version of an article increments the use count of all subsequent versions. Views to a newer version of an article do not affect the use count of previous versions.</td>
</tr>
</tbody>
</table>
Knowledge article version numbers

Knowledge article version numbers follow a specific pattern. Increments to the version number depend on the revision type.

Article version numbers follow this pattern: <major release number.minor release number>

The type of revision being made to an article determines the increment. A minor revision increments the version number by 0.01. A major revision, such as publishing an article, increments the version to the next whole number, for example, from version 2.02 to 3.0.

The following example illustrates the life cycle of a versioned article and the changes to the version number.

<table>
<thead>
<tr>
<th>User action</th>
<th>Article state</th>
<th>Version number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge author creates a new article</td>
<td>Draft</td>
<td>0.01</td>
</tr>
<tr>
<td>Knowledge author makes a change and updates the article.</td>
<td>Draft</td>
<td>0.01</td>
</tr>
<tr>
<td>Knowledge author submits the article for review.</td>
<td>Review</td>
<td>0.02</td>
</tr>
<tr>
<td>Knowledge author recalls the article to make another change.</td>
<td>Draft</td>
<td>0.03</td>
</tr>
<tr>
<td>Knowledge article submits the article for review</td>
<td>Review</td>
<td>0.04</td>
</tr>
<tr>
<td>Approver rejects the article and requests a change.</td>
<td>Draft</td>
<td>0.05</td>
</tr>
<tr>
<td>Knowledge author makes the change and submits the article for review.</td>
<td>Review</td>
<td>0.06</td>
</tr>
<tr>
<td>Approver approves the article</td>
<td>Published</td>
<td>1.0</td>
</tr>
<tr>
<td>Knowledge author checks out the published article.</td>
<td>Draft</td>
<td>1.01</td>
</tr>
<tr>
<td>Knowledge author submits the article for review.</td>
<td>Review</td>
<td>1.02</td>
</tr>
<tr>
<td>Approver approves the article</td>
<td>Published</td>
<td>2.0</td>
</tr>
<tr>
<td>When the version 2.0 article is published, the state of the version 1.0 article changes to Outdated.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Any change to the state of an article results in a version increment, except to and from the Pending retirement, Retired, and Outdated states.

Knowledge article version information

Users can view version information for a knowledge article from the Knowledge view page.
The knowledge article number and the version number appear at the top of the article, just below the title. Clicking the version number expands the version history section, which includes a list of the available article versions. User roles determine what is included in this list:

- Users with read access to a knowledge base can see the latest published version and previous major versions.
- Users with read and contribute access to a knowledge base can see the latest published version, previous major versions, and any draft or review versions.

You can view any of the previous versions of an article by clicking the version number in the list. When you view a previous version, a message at the top of the article indicates that an updated version is available.

At the bottom of a knowledge article, you can see additional information about an article, including the name of the author or revisor and the date that the article was last modified.

**Knowledge article states**

A versioned knowledge article can be in one of several states as it progresses through the creation cycle.

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draft</td>
<td>The article is in the process of being created.</td>
</tr>
<tr>
<td>Review</td>
<td>The draft version of the article is sent to reviewers to approve or reject.</td>
</tr>
<tr>
<td>Published</td>
<td>The article is approved and published. When the state of an article changes to Published, the state of any previous published versions of that article changes to Outdated.</td>
</tr>
<tr>
<td>Pending retirement</td>
<td>The published article is selected for retirement, pending approval.</td>
</tr>
<tr>
<td>Retired</td>
<td>The published article is retired. Retired knowledge articles cannot be searched for by external users or customers. To reuse a retired article, create a new article with the same content, which is published once approved.</td>
</tr>
<tr>
<td>Outdated</td>
<td>A more recent version of the article has been published. End users can read published articles as well as the outdated versions.</td>
</tr>
</tbody>
</table>

**Article versioning properties**

The knowledge administrator can set configuration properties that enable users to edit specific fields on published articles without creating new versions.
<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable article versioning feature. (glide.knowman.versioning.enabled)</td>
<td>Select the Yes check box to enable the article versioning feature.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td></td>
<td>• Location: Knowledge Administration Properties</td>
</tr>
<tr>
<td>Enable minor edits to a published article without creating a new version.</td>
<td>Select the Yes check box to enable minor edits to published articles without creating a new version.</td>
</tr>
<tr>
<td>(glide.knowman.versioning.enable_minor_edits)</td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: false</td>
</tr>
<tr>
<td></td>
<td>• Location: Knowledge Administration Properties</td>
</tr>
<tr>
<td>Note:</td>
<td>This feature is available for the following users: the knowledge administrator, the knowledge base manager, and the knowledge base owner.</td>
</tr>
<tr>
<td>A comma-separated list of fields that can be edited on published articles without creating a new version. (glide.knowman.versioning.minor_edit_fields)</td>
<td>Enter the fields in a comma-separated list that can be edited on published articles without creating a new version.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: valid_to</td>
</tr>
<tr>
<td></td>
<td>• Location: Knowledge Administration Properties</td>
</tr>
</tbody>
</table>

### Check out a published article and create a new version

Create a new version of a knowledge article by checking out the latest published version.

Users with canContribute permissions, including the knowledge owner, knowledge manager, and knowledge administrator, can check out a published article unless there is already a checked out version. If a version has been checked out, the Checkout button does not appear on the Knowledge form header.

When you check out an article, attachments from the article’s base version are copied into the new article version and relative paths to these attachments are also updated.

**Note:** For article versions that were created in the previous releases, the relative paths to the attachments may not be updated. To update them, activate and run the Fix attachment links on article versions fix script.

1. Navigate to Knowledge Articles Published.
2. Select the desired article from the list.
3. Click Checkout in the Knowledge form header.
   The system creates a new version of the knowledge article and displays a message to the user. The article number for the new version remains the same, the version number is increased by 0.01, and
the state changes to Draft. The new version of the article is added to the Knowledge list and to the Article Versions related list on the Knowledge form.

Approve an article that is being reviewed

Approve an article that is being reviewed and create a new published version.

When an article is in the Review state, only those users who are included in the Approvals related list can modify the article.

1. Navigate to Knowledge Articles Unpublished.
2. Open an article in the Review state and review the text.
3. In the Approvals related list, click Requested in the State column to display the Approval form for the article.
4. Click Approve.
   The system displays the Knowledge form. The version number of the article increments to the next whole number (for example, from 2.02 to 3.0) and the state changes to Published. The new published version of the article is added to the Knowledge list and to the Article Versions related list on the Knowledge form.

Revert an outdated article to the current state

Use an outdated version of an article to create a new version.

Roles required: knowledge base owner, knowledge_manager, knowledge_admin

This action is available for earlier published version that have a state of Outdated and only when there is no checked out version. If a version has been checked out, the Make this current button does not appear on the Knowledge form header.

1. Navigate to Knowledge Articles All.
2. Open an article in the Outdated state.
3. Click Make this current in the Knowledge form header.
   The system displays the Knowledge form. The version number increments to the latest version number plus 0.01 and the state changes to Draft. For example, if the latest published version of an article is 3.0 and you select the outdated 1.0 version to become the current version, the version number increments to 3.01.

Recall an article that is being reviewed

Recall an article that is being reviewed to make additional changes.

When a revised article is in the Review state, only the corresponding versions reviser can recall the article to make additional changes. When a newly created article is in the Review state, only the author can recall the article. Recalling an article in the Review state results in a minor version increment.

1. Navigate to Knowledge Articles All.
2. Open an article in the Review state.
3. Click Recall in the Knowledge form header.
   The system returns the state of the article to Draft, increments the version number by 0.01, and displays a message to the user.
View all versions of an article

View a list of all available versions for a selected knowledge article and then view the selected version in a new tab.

The list of all available versions for a selected knowledge article is displayed in the Article Versions related list on the Knowledge form. Users with read access can see major versions. Users with contribute access can see major and minor versions.

1. Navigate to Knowledge Articles All.
2. Open the desired article.
3. Click the Article Versions tab to display the related list.
4. Click Version to display the desired article version in a new tab.
5. If desired, click the View Version related link to see the article view page.

Compare two versions of an article

Select and compare two versions of a knowledge article.

Role required: knowledge_manager, knowledge_admin

1. Navigate to a knowledge article with multiple versions.
2. In the Article Versions related list, select two versions of the article to compare.
3. In the Actions choice list below the list, select Compare.
   The Compare Versions page opens in a new tab and lists the fields for the selected articles in a side-by-side format. Differences between the two articles are highlighted.
4. When you are finished comparing the two versions, click Done to return to the Knowledge form.

Retire a versioned article

You can retire the latest published version of a knowledge article. Retiring a knowledge article does not create a new version. It simply marks the article as Retired.

This action is available only when there is no checked out version. If a version has been checked out, the Retire button does not appear on the Knowledge form header.

**Note:** For the Knowledge - Approval Retire workflow, this happens only when the retire request is approved.

In addition to the knowledge administrator and the knowledge manager, the following users can retire a versioned article:

- knowledge owner
- author of the versioned knowledge article
- reviser of the versioned knowledge article

Users can still access outdated articles that have been attached to incidents by navigating to the article view page with the sys_id of the article. Outdated articles include a message that an updated article is available.

If versioning is disabled, only the latest version of the article is shown in search results and list views.
Retired knowledge articles cannot be searched for by external users or customers. To reuse a retired article, create a new article with the same content, which is published once approved.

1. Navigate to Knowledge Articles Published.
2. Open the desired article.
3. Click Retire in the Knowledge form header.
   The system returns to the Knowledge list. The state of the article changes to Pending retirement and the state of previously published versions change to Outdated.

   **Note:** You cannot check out or edit a retired article.

### Disable the article versioning feature

Users with the system administrator role can disable the article versioning feature by setting a property.

**Role required:** admin

The Enable article versioning feature property controls the article versioning feature. Setting this property to false disables the article versioning feature. Once disabled:

- The Version field is removed from the Knowledge form. The Version column remains on the Knowledge list and can be removed manually.
- The Article Versions related list is removed from the Knowledge form.
- The Recall, Checkout, and Make this current buttons are removed from the Knowledge form.
- Outdated articles are removed from Knowledge list views.
- The version history does not appear on the article view page.

Articles continue to be versioned in the background. Minor versions are incremented until an article is published and then the version number is increased to the next major version.

Users can still access outdated articles that have been attached to incidents. Outdated articles include a message that an updated article is available.

1. Navigate to Knowledge Administration Properties.
2. Locate the Enable article versioning feature property in the Article Versioning Properties section.
3. Click the check box to disable the property.
4. Click Save.

### Knowledge Management guide for users

After knowledge bases are set up, you can start searching and creating articles. If Social Q&A was activated for the knowledge base, you can also submit answers or answer questions for other users.

#### Requirements

**Role required**

None. All users can read, create, and edit knowledge articles in a knowledge base, unless the knowledge manager has restricted access to it.

If you need these permissions, contact the knowledge manager for the knowledge base.
## What to do

### Create knowledge articles
If you have the required permissions for a knowledge base, you can create articles for it. You can create articles from the **Self-Service application menu** or by importing Word documents.
You can also create knowledge articles from **incidents and problems**.

### Search for knowledge articles
From the **Knowledge homepage**, you can select a knowledge base to **search for articles and answers**.
You can view only the knowledge bases to which you have access.
You can also search knowledge from within an **incident**.
Access to knowledge using **your mobile device** is supported.

### Ask and answer questions
If **Social Q&A** on page 1388 was activated for a knowledge base, you can ask and answer questions. You can also browse and vote on answers.

## Next steps
After articles are created, you can perform the following tasks to make sure that articles are organized in the right knowledge bases and retired when appropriate. If existing knowledge bases do not fit your needs, you can request a new knowledge base.

- [Move a knowledge article](page 1396)
- [Retire a knowledge article](page 1397)
- [Request a knowledge base](page 1393)

## Knowledge Management Service Portal
The Knowledge Management Service Portal enables users to perform the same operations that are available with the Knowledge Management V3 plugin. From the portal, users can view knowledge bases and articles, search for information, sort and filter search results, and provide feedback.

System administrators can customize portal pages and configure widgets for searching, sorting, and filtering knowledge base information.

To use the Knowledge Management Service Portal:

1. **Activate the Knowledge Management - Service Portal plugin** (com.snc.knowledge_serviceportal).
2. Configure the **Knowledge Management Service Portal properties**, including the property that directs users to the Knowledge Management Service Portal homepage.
Customizing the Knowledge Management Service Portal

The Knowledge Management Service Portal is comprised of three pages and multiple widgets. Users with the system administrator role can customize the pages and widgets as desired.

- To customize this portal, navigate to Service Portal Portals and click Knowledge Portal. See Service Portal for more information about creating a custom interface.
- To configure widget instance options and customize the search, sort, and filter features, see Knowledge Management Service Portal widgets.

Section 508 compliance features

Users can view and interact with the Knowledge Management Service Portal article view page using Section 508 compliance features. See Set up Section 508 compliance features for more information.

Activate the Knowledge Management Service Portal plugin

You can activate the Knowledge Management - Service Portal plugin (com.snc.knowledge_serviceportal) if you have the admin role.

Role required: admin

This plugin requires the following plugins:

- Knowledge Management V3 (com.snc.knowledge3)
- Service Portal for Enterprise Service Management (com.glide.service-portal.esm)

1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.
   - If the plugin depends on other plugins, these plugins are listed along with their activation status.
   - If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).
4. If available, select the Load demo data check box.
   - Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.
   - You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.
5. Click Activate.

Knowledge V3 homepage and Knowledge Management Service Portal comparison

A comparison of the features available on the Knowledge Management V3 homepage and the Knowledge Management Service Portal.
<table>
<thead>
<tr>
<th>Page</th>
<th>Component</th>
<th>V3 Homepage</th>
<th>Knowledge Management Service Portal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home page</td>
<td>Create an article</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Post a question</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Import an article</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Knowledge bases</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Featured content</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Most useful</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Most viewed</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Language selection menu</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Search text box</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Search results page</td>
<td>Create an article</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Post a question</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Import an article</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Search box with language selection</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Sort by</td>
<td>Relevancy</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Last updated (newest)</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Views</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Alphabetical</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Filter by</td>
<td>Knowledge bases</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Categories</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Authors</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Tags</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Resource</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Rating</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>View count</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Article meta data</td>
<td>Authored by</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Article number</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Last modified</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Category</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Number of views</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Star rating</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Relevancy rank</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Page</td>
<td>Component</td>
<td>V3 Homepage</td>
<td>Knowledge Management Service Portal</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------------------------------</td>
<td>-------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Tags</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Attachments</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Article view page</td>
<td>Back button</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Create Favorite icon</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Navigation hierarchy path</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Article meta data</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>• Article number</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Article version</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Authored by</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Last modified</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Number of views</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Star rating</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Subscribe option</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Flag article option</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Create incident option</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Edit option</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Article language selection</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>option</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Helpful yes/no option</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Star rating</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Text box for comments</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Live feed comment</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Copy permalink</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Most Recent Tasks widget</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Affected Products widget</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Most Viewed widget</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Most Useful widget</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Page</td>
<td>Component</td>
<td>V3 Homepage</td>
<td>Knowledge Management Service Portal</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------------------</td>
<td>-------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>Post a question / Ask a question page</td>
<td>Back button</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Cancel button</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Post Question button</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Search box</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Title</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Text editor</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Knowledge base</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Category</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Tags</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Cancel button</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Social QA view page</td>
<td>Back button</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Navigation path</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Up / down voting</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Subscribe option</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Showing tags</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Share / edit / delete options</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Text editor for answer</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Ask a Question button</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Question Stats widget</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Recent Questions widget</td>
<td>N</td>
<td>Y</td>
</tr>
</tbody>
</table>

**Features not yet supported on Knowledge Management Service Portal**

The following features are not yet supported on the Knowledge Management Service Portal:

- Article import on the Search results page
- Hierarchical categories on the Article view page
- Live Feed support for Social Q&A on the Article view page
- Tags added in Social Q&A are not honored in search results

The `glide.knowman.portal.enable_redirect` property is not honored for the following use cases:

- Contextual search in the Incident form
Knowledge Management Service Portal properties

The knowledge administrator can set configuration properties that determine how information is displayed on the Knowledge portal.

The following system properties are set to direct users to the Knowledge Management Service Portal homepage, and to specify the URL suffix for the homepage.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sn_km_portal.glide.knowman.serviceportal.enable_redirect</td>
<td>Directs users to the desired Knowledge homepage.</td>
</tr>
<tr>
<td></td>
<td>• Set to true to direct users to the Knowledge Management Service Portal homepage.</td>
</tr>
<tr>
<td></td>
<td>• Set to false to direct users to the Knowledge Management v3 homepage.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This property is not honored for the following use cases:</td>
</tr>
<tr>
<td></td>
<td>• Contextual search in the Incident form</td>
</tr>
<tr>
<td></td>
<td>• Connect</td>
</tr>
<tr>
<td>sn_km_portal.glide.knowman.serviceportal.portal_url</td>
<td>The URL suffix for the Knowledge Management Service Portal. The default is kb.</td>
</tr>
</tbody>
</table>

The Knowledge Management Service Portal supports the Knowledge Management V3 properties. Configuring widget instance options on the portal pages can override these properties.

Knowledge Management Service Portal pages

The Knowledge Management Service Portal includes a homepage, a search results page, and an article view page.

**Homepage**

The Knowledge Management Service Portal landing page. This page includes a search bar, knowledge bases, and lists of knowledge articles.

- Users can search for information, explore knowledge bases, and view featured articles.
- Administrators can customize the page layout, add knowledge bases, and add article collections (for example, a list of the most viewed articles).

**Search results page**

This page displays a list of search results and includes several options for sorting and filtering the information.
• Users can sort and filter search results in multiple ways.
• Administrators can customize the page layout, configure the sort and filter widgets to use any field on the Knowledge (kb_knowledge) table, and also configure the filter widgets to use custom queries.

**Article view page**

This page displays the selected knowledge article or social Q&A item.

• Users can view articles and provide comments and ratings. If enabled, users can subscribe to articles, view article versions, and create incidents for articles that are rated as not helpful. Users can also view and edit questions and provide comments or answers.
• Administrators can customize the page layout and enable or disable user actions, such as creating an incident for an article. Administrators can also activate the plugins to enable article versioning and article subscriptions.

**Knowledge Management Service Portal homepage**

The Knowledge Management Service Portal homepage displays knowledge articles and social Q&A items organized by knowledge base and category, as well as featured content and popular articles.

To view the Knowledge Management Service Portal homepage, navigate to one of the following:

• Self Service Knowledge
• Knowledge Homepage

**Note:** To use the Knowledge Management Service Portal, activate the Knowledge Management - Service Portal plugin (com.snc.knowledge_serviceportal) and enable the glide.knowman.serviceportal.enable_redirect property.
The Knowledge Management Service Portal homepage includes the following:

**Header**

The header contains a search bar and counters that display the number of available knowledge bases and the total number of knowledge articles and social Q&A items.

**Knowledge bases**

Each knowledge base is represented by a tile that includes the knowledge base icon and name. Icons and counters below the knowledge base name display the number and type of items stored in the knowledge base, such as articles and questions. By default, tiles are ordered alphabetically by knowledge base name.

**List collections**

Lists of articles, including featured, most useful, and most viewed articles. By default, these lists display articles by the article Short description and include information such as the author name, number of views, and average rating.

**Note:** The Knowledge Management Service Portal homepage is mobile responsive.

### Using the homepage

From the Knowledge Management Service Portal homepage, you can do the following.

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Search for information</td>
<td>Use the search bar to search knowledge bases and social Q&amp;A.</td>
</tr>
<tr>
<td>View knowledge bases</td>
<td>Knowledge bases available to the user are arranged in alphabetical order.</td>
</tr>
<tr>
<td>View articles</td>
<td>Select articles from the article collection lists.</td>
</tr>
<tr>
<td>Ask a question</td>
<td>This action is available to logged in users with the knowledge role. Click Ask a Question, which opens a question page. Fill in the Question and Question details fields, and click Post question to post the question.</td>
</tr>
<tr>
<td>Create an article</td>
<td>This action is available to logged in users with the knowledge role. Click the Overflow icon (*** ) and select Create Article, which opens a new Knowledge record with an assigned number. Fill in the fields and click Submit to return to the Knowledge Management Service Portal.</td>
</tr>
<tr>
<td>Action</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Subscribe to a knowledge base</td>
<td>This action is available to logged in users; availability is based on knowledge subscriptions user roles. Click Subscribe at the top of a knowledge base tile to subscribe to that knowledge base. Unsubscribe by clicking Unsubscribe. See Knowledge subscriptions for more information.</td>
</tr>
</tbody>
</table>

Knowledge Management Service Portal search results page

The Knowledge Management Service Portal search results page displays a list of search results as well as options for sorting and filtering the items in the list.
Deleted Email Recovery
Forum > Outlook > Outlook 2016
Deleted Email Recovery:
Every email deleted from your OWA mailbox goes through the following process:
The email is moved to your Deleted Items folder. If you purge or remove items from the Deleted Items folder, the email is moved to the De:**
Ron Kettling < 0 Views < 8d ago > *""""""""""

What is Spam?
Forum > Outlook
Spam is a term used to describe unsolicited email messages. Spam is often used to refer to email messages that contain unsolicited commercial email (UCE) or unsolicited bulk email (UBE).
Ron Kettling < 1 View < 8d ago > *""""""""""

How to Deal with Spam
Forum > Outlook
When you receive a spam message, you can delete it or filter it. You can also mark it as spam or flag it.
Ron Kettling < 3 Views < 3y ago > *""""""""""

What are phishing scams and how can I avoid them?
Forum > Outlook
Phishing scams are typically fraudulent emails that contain links to websites that look legitimate but are actually designed to steal sensitive information. Here are some tips to avoid phishing scams:
Ron Kettling < 0 Views < 8d ago > *""""""""""

Create an Email Signature
Forum > Outlook 2016
To create a personalized email signature, open a new message. In the Message tab, click the Include group, click Signature, and then click Signatures. In the E-mail Signature tab, click New, and then type or paste your signature text. Click OK to save the signature.
Ron Kettling < 0 Views < 3y ago > *""""""""""
The Knowledge Management Service Portal search results page includes:

**Search results list**

The search results list includes knowledge articles, pinned articles, and social Q&A items. For knowledge articles, the search results include articles in which the short description, text content, or attached file content includes the search term. For social Q&A items, search results include answered and unanswered questions, and questions with accepted answers. The following information displays for each list item:

- The article short description or the question.
- The knowledge base in which the item is stored.
- The first two lines of text from the article or question.
- Information about the item such as the author name, the number of views, and rating information.
- An icon that represents the type of item.

**Search results list header**

The header displays the number of search results, which updates as the user selects and de-selects filters. Selected filter options appear just below the number of search results. The header also includes the available sort options.

**Filter facet widgets**

A number of filter facet widgets appear to the left of the search results list. Each filter facet widget includes a list of selectable options that can be used to refine the search results.

- Knowledge Base: lists the available knowledge bases
- Category: lists the available knowledge categories
- Author: lists the names of the authors for the knowledge articles included in the search results list
- Tags: lists the available knowledge tags
- Resource: lists the types of items available, such as knowledge articles and social Q&A
- Rating: lists article ratings from 0-5 stars (clicking a rating displays articles that have the selected rating and higher)
- Last Modified: lists selections based on the timing of knowledge item modifications such as Past Month or Past Week
- View Count: lists the knowledge item view counts such as More Than 50 or Less Than 10. Set the number of days to consider when calculating view count using the glide.knowman.view_age.days property.
Using the search results page

From the Knowledge Service Portal homepage, you can perform the following actions.

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perform a search</td>
<td>Use the search bar at the top of the page to search for additional information.</td>
</tr>
<tr>
<td>Sort the search results</td>
<td>Click a sort option in the search results list header to sort list items by relevance to the search term, number of views, newest, or alphabetical. Items are sorted in ascending order. Click the option again to sort in descending order.</td>
</tr>
</tbody>
</table>
| Filter the search results | Select options in the filter facet widgets to filter the items in the search results list. Clear selected filter options by:  
  • Deleting a single option from the search results list header.  
  • Clicking Clear all in the search results list header.  
  • Clicking Clear in the filter facet widget header. |
| View additional search results | Depending on the system setup, view additional search results using one of these options:  
  • Standard Pagination: displays the search results in multiple pages.  
  • Infinite Scroll: displays the search results while scrolling. |

Knowledge Management Service Portal article view page

The Knowledge Management Service Portal article view page displays the selected knowledge article, including the article number, short description, and article content.

If users select a question, the article view page displays the question, any answers to the question, and a text box for providing an answer.
Create An Email Signature

To create a personalized email signature:

1. Open a new message. On the Message tab, in the Include group, click Signature, and then click Signatures.
2. On the E-Mail Signature tab, click New.
3. Type a name for the signature, and then click OK.
4. In the Edit signature box, type the text that you want to include in the signature.
5. To format the text, select the text, and then use the style and formatting buttons to select the options that you want.
6. To add elements besides text, click where you want the element to appear, and then do any of the following:

<table>
<thead>
<tr>
<th>Options</th>
<th>How to</th>
</tr>
</thead>
<tbody>
<tr>
<td>To add an electronic business card</td>
<td>Click Business Card, and then click a contact in the Filed As list. Then click OK</td>
</tr>
<tr>
<td>To add a hyperlink</td>
<td>Click Insert Hyperlink, type in the information or browse to a hyperlink, click to select it, and then click OK</td>
</tr>
<tr>
<td>To add a picture</td>
<td>Click Picture, browse to a picture, click to select it, and then click OK. Common image file formats for pictures include .bmp, .gif, .jpg, and .png.</td>
</tr>
</tbody>
</table>

1. To finish creating the signature, click OK.

NOTE:
The signature that you just created or modified won't appear in the currently open message; it must be inserted into the message.
The Knowledge Management Service Portal article view page includes the following:

**Header**
For knowledge articles, the header includes the knowledge article number and enabled user actions. For questions, the header includes the question text.

**Knowledge article meta data**
Article information including the short description and author name, the date that the article was last modified, the number of views, and the average rating. If configured, it also includes article version information.

**Article or question content**
The text and images of the knowledge article or question.

**Feedback options**
Article feedback options include marking the article as helpful, rating the article, and providing a comment. Question feedback options include sharing a question, commenting on a question, providing an answer, and accepting an answer.

**List widgets**
The article view page includes the following list widgets for articles and questions:
- Most Recent Tasks
- Affected Products
- Most Viewed
- Most Useful
- Question Stats
- Recent Questions

From the Knowledge Service Portal article view page, you can do the following.

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>View content</td>
<td>View a knowledge article or question.</td>
</tr>
<tr>
<td>Edit an article</td>
<td>Users with contribute access can edit an article.</td>
</tr>
<tr>
<td>Flag an article</td>
<td>Users with contribute access can flag an article that contains incorrect or inappropriate content.</td>
</tr>
<tr>
<td>Subscribe to an article</td>
<td>This action is available to logged in users; availability is based on knowledge subscriptions user roles. Click Subscribe in the article header to subscribe to that knowledge article. Unsubscribe by clicking Unsubscribe. See Knowledge subscriptions for more information.</td>
</tr>
<tr>
<td>Copy the permalink to the article</td>
<td>Users can click Copy Permalink to copy the latest version of the article to the clipboard.</td>
</tr>
<tr>
<td>Action</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Create an incident</td>
<td>If configured, the Create Incident link appears at the bottom of the article after the article is rated as not helpful.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Use the widget instance option for the article view page to enable the display of this link.</td>
</tr>
<tr>
<td>Provide feedback to an article</td>
<td>Feedback options include marking an article as helpful, providing a rating from one to five stars, and adding a comment. See Knowledge feedback for more information.</td>
</tr>
<tr>
<td>Post a question</td>
<td>All users can post a question.</td>
</tr>
<tr>
<td>Answer a question</td>
<td>All users can provide an answer to a question.</td>
</tr>
<tr>
<td>Accept an answer</td>
<td>The knowledge manager or the owner of a question can accept an answer as the correct answer.</td>
</tr>
<tr>
<td>Comment on a question or answer</td>
<td>All users can add a comment to a question or to an answer.</td>
</tr>
<tr>
<td>Edit a question, answer, or comment</td>
<td>All users can edit the questions, answers, and comments that they submit. Knowledge managers can edit questions, answers, and comments for the knowledge bases that they manage.</td>
</tr>
</tbody>
</table>

**Note:** For more information, see Social Q&A questions.

Enable external or public users to view knowledge articles from the Knowledge Service Portal

Enable knowledge articles on the Knowledge Management Service Portal to be visible to external or public users.

The Knowledge Management Service Portal plugin (com.snc.knowledge_serviceportal) must be enabled.

Role required: admin

If you are using Knowledge Management within the Customer Service application, you can automatically make knowledge public by activating and running the Make KM Service Portal Pages Public fix script after you install the Customer Service Management plugin (com.sn_customerservice).

If you are using Knowledge Management as a standalone application, perform the steps in this procedure.

1. Navigate to Service Portal Pages.
2. Search for kb_home and open it.
3. You have to be in the Global application to edit. If a message appears, click here to edit.
4. Perform one of the following actions.
To | Make knowledge service portal pages visible to public users
---|---
Do this | 1. Select the Public check box.  
2. Click Update.

To | Make knowledge service portal pages visible to external users
---|---
Do this | 1. Click the edit user roles icon.  
2. Select snc_external and click Done.  
3. Click Update.

5. Repeat these steps for kb_article_view and kb_search.
6. Perform one of the following actions.

<table>
<thead>
<tr>
<th>To</th>
<th>Do this</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable access to the knowledge base for public users</td>
<td>Ensure that no Can Read user criteria is defined in the knowledge bases you want to give access to.</td>
</tr>
</tbody>
</table>

| To | Enable access to the knowledge base for external users | Add Can Read access to the knowledge base. |

Knowledge Management Service Portal widgets

The Knowledge Management Service Portal uses a number of widgets to enable searches, display search results, and display articles and social Q&A.

The Knowledge Management Service Portal homepage, search results page, and article view page honor the Knowledge Management V3 system properties. If configured, widget instance options can override the system properties.

Users with the knowledge_admin or admin role can configure the widget instance options used on the Knowledge Management Service Portal pages. Use the control + right-click menu to access the widget instance options and configure a widget instance.

**Note:** Before configuring widget instance options, switch to the Knowledge Management - Service Portal scope.

**Homepage widgets:**
- Knowledge Homepage Search
- Knowledge Bases Browse
- Knowledge Featured Articles
- Knowledge Most Useful Articles
- Knowledge Most Viewed Articles

**Search results page widgets:**
- Knowledge Breadcrumbs
- Knowledge Search
- Knowledge Facet Header
- Knowledge Field Facet
- Knowledge Tags Facet
- Knowledge Resource Facet
- Knowledge Query Facet
- Knowledge Result Sort
- Knowledge Selected Filter
- Knowledge Result

Article view page widgets:
- Knowledge Breadcrumbs
- Knowledge Article Content
- Knowledge Article Helpful
- Knowledge Article Comments
- Knowledge Attachments
- Knowledge Attached Tasks
- Knowledge Affected Products
- Knowledge Most Viewed Articles
- Knowledge Most Useful Articles

Configure search widget instance options

Configure widget instance options for the search widgets on the Knowledge Management Service Portal homepage and search results page.

Role required: knowledge_admin or admin

The homepage uses the Knowledge Homepage Search widget and the search results page uses the Knowledge Search widget. Use the widget instance options to customize the search feature for these pages.

1. Navigate to the Knowledge Management Service Portal homepage or search results page.
2. Control + right-click the search bar.
3. Click Instance Options.
4. Configure the desired settings for the search widgets.

<table>
<thead>
<tr>
<th>Instance option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>The title of the search widget. The default for the homepage is Welcome to Knowledge.</td>
</tr>
<tr>
<td>Glyph</td>
<td>An icon that appears in the search bar.</td>
</tr>
<tr>
<td>Bootstrap color</td>
<td>The color of the search widget.</td>
</tr>
<tr>
<td>Bootstrap size</td>
<td>The size of the search widget.</td>
</tr>
<tr>
<td>CSS</td>
<td>See widget CSS for details.</td>
</tr>
<tr>
<td>Search Placeholder</td>
<td>Default text that appears in the search bar.</td>
</tr>
<tr>
<td>Allow Empty Search</td>
<td>Allow empty knowledge base searches. The default for the homepage uses the system property. The default for the search results page is Yes. For an empty search, the search results page returns all results.</td>
</tr>
<tr>
<td>Instance option</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Allow Instant Search On Keypress</td>
<td>Enables instant search results as you type a search term. The default for the search results page uses the system property.</td>
</tr>
<tr>
<td>Minimum Number of Characters for Search</td>
<td>The minimum number of characters required to generate a search.</td>
</tr>
<tr>
<td>Wait time (ms) between searches, if instant search is enabled</td>
<td>The time, in milliseconds, to wait between searches if the instant search feature is enabled. The default wait time is 500 ms.</td>
</tr>
<tr>
<td>Alternate URL Parameters for Search</td>
<td>Alternate parameters that appear in the search results URL. By default these parameters include keyword and query.</td>
</tr>
<tr>
<td>Alternate URL Parameters for Language</td>
<td>Alternate parameters that appear in the URL denoting the selected language.</td>
</tr>
</tbody>
</table>

5. Click Save.

Configure knowledge base tile widget instance options

Configure widget instance options for the knowledge base tile widgets on the Knowledge Management Service Portal homepage.

Role required: knowledge_admin or admin

The homepage uses the Knowledge Bases Browse widget to display knowledge base tiles.

1. Navigate to the Knowledge Management Service Portal homepage.
2. Control + right-click a knowledge base tile.
3. Click Instance Options.
4. Configure the desired settings for the knowledge base tile widgets.

<table>
<thead>
<tr>
<th>Instance option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>The title that appears above the knowledge base tiles. The default is Explore our Knowledge Bases.</td>
</tr>
<tr>
<td>Bootstrap color</td>
<td>The color of the widget.</td>
</tr>
<tr>
<td>CSS</td>
<td>See <a href="#">widget CSS</a> for details.</td>
</tr>
<tr>
<td>Order By</td>
<td>The order in which the knowledge base tiles appear on the homepage. Use any field on the Knowledge table. If this field is empty, tiles are displayed in alphabetical order. Other available options include article_count.</td>
</tr>
<tr>
<td>Reverse Order</td>
<td>Enable this check box to display knowledge base tiles in the reverse order.</td>
</tr>
<tr>
<td>Post Question Label</td>
<td>The label on the button used to post a question. The default is Ask a Question.</td>
</tr>
<tr>
<td>Create Article Label</td>
<td>The label on the button used to create an article. The default is Create Article.</td>
</tr>
</tbody>
</table>
## Configure sort widget instance options

Configure widget instance options for the knowledge sort widget on the Knowledge Management Service Portal search results page.

**Role required:** knowledge_admin or admin

The search results page uses the Knowledge Result Sort widget to provide sort options for the returned list of results. Use the widget instance options to customize the sort options.

1. Navigate to the Knowledge Management Service Portal search results page.
2. Control + right-click the sort options at the top of the results list.
3. Click Instance Options.
4. Configure the desired settings for the sort widget.

<table>
<thead>
<tr>
<th>Instance option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bootstrap color</td>
<td>The color of the search widget.</td>
</tr>
<tr>
<td>CSS</td>
<td>See <a href="#">widget CSS</a> for details.</td>
</tr>
<tr>
<td>Hide Relevancy</td>
<td>Removes the relevancy sort option.</td>
</tr>
<tr>
<td>Table</td>
<td>The table that contains the fields used to sort the list of knowledge items. The default table is Knowledge.</td>
</tr>
<tr>
<td>Sort Fields</td>
<td>The fields used for sorting the list of knowledge items.</td>
</tr>
<tr>
<td>Sort Field Labels</td>
<td>The labels for the fields that appear in the sort options. The default is Views:desc,Newest:desc,Alphabetical. The sort order for the sort field labels is ascending. To use a descending order, denote :desc.</td>
</tr>
</tbody>
</table>

5. Click Save.

## Configure article list widget instance options

Configure widget instance options for the article lists on the Knowledge Management Service Portal homepage.

**Role required:** knowledge_admin or admin

The homepage uses the Article List widget to display different lists of articles, including Featured, Most Useful, and Most Viewed.

1. Navigate to the Knowledge Management Service Portal homepage.
2. Control + right-click one of the article list headers.
3. Click Instance Options.
4. Configure the desired settings for the article list widget.

<table>
<thead>
<tr>
<th>Instance option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>The title of the article list.</td>
</tr>
<tr>
<td>Bootstrap color</td>
<td>The color of the widget.</td>
</tr>
<tr>
<td>Glyph</td>
<td>An icon that appears in the widget.</td>
</tr>
<tr>
<td>CSS</td>
<td>See <a href="#">widget CSS</a> for details.</td>
</tr>
<tr>
<td>Table</td>
<td>The table that stores the list articles.</td>
</tr>
<tr>
<td>Display Field</td>
<td>The title displayed for each article in the list. By default, this is the article short description.</td>
</tr>
<tr>
<td>Secondary Fields</td>
<td>Additional information displayed for each article in the list below the title. By default, this information includes the author, view count, the date that the article was last modified, and the article rating.</td>
</tr>
<tr>
<td>Max number of records to show</td>
<td>The maximum number of articles to include in the list.</td>
</tr>
<tr>
<td>Show even when empty</td>
<td>Enable this check box to display the article list even if it does not contain any articles.</td>
</tr>
<tr>
<td>Show Secondary Fields Label</td>
<td>Enable this check box to display the field labels for the additional information displayed for each article.</td>
</tr>
<tr>
<td>Knowledge Base</td>
<td>To restrict the articles that appear in this list to a specific knowledge base, select the knowledge base from the knowledge base list.</td>
</tr>
</tbody>
</table>

5. Click Save.

Configure search results list widget instance options

Configure widget instance options for the results list widget on the Knowledge Management Service Portal search results page.

Role required: knowledge_admin or admin

The search results page uses the Knowledge Result widget to provide display options for the returned list of results. Use the widget instance options to customize the display options.

1. Navigate to the Knowledge Management Service Portal search results page.
2. Control + right-click the list of returned search results.
3. Click Instance Options.
4. Configure the desired settings for the results list widget.

<table>
<thead>
<tr>
<th>Instance option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glyph</td>
<td>An icon that appears in the search bar.</td>
</tr>
<tr>
<td>Instance option</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>CSS</td>
<td>See <em>widget CSS</em> for details.</td>
</tr>
<tr>
<td>Show Relevancy Score</td>
<td>Shows how relevant each search result is based on the search term. The default setting uses the system property.</td>
</tr>
<tr>
<td>Breadcrumb: Hide Categories</td>
<td>Hides the category in the breadcrumb that appears below the article short description or question in the results list. The default setting uses the system property.</td>
</tr>
<tr>
<td>Breadcrumb: Knowledge Base Separator</td>
<td>The character used as a separator between the knowledge base and the category in the breadcrumb.</td>
</tr>
<tr>
<td>Breadcrumb: Category Separator</td>
<td>The character used as a separator between categories in the breadcrumb.</td>
</tr>
<tr>
<td>Default Sort Order</td>
<td>The default sort order for the list of returned results. The default sort order is <code>sys_view_count:desc</code>, which sorts the results by the number of views in descending order.</td>
</tr>
<tr>
<td>How to Display Attachments in Knowledge Search Results</td>
<td>How attachments are shown in the list of returned results. The default uses the system property.</td>
</tr>
<tr>
<td>Label for Show Pinned Articles Link</td>
<td>The text used for the pinned articles link.</td>
</tr>
<tr>
<td>Table</td>
<td>The table that stores the information returned in the search results.</td>
</tr>
<tr>
<td>Knowledge Secondary Fields</td>
<td>Fields that display additional information for each article in the search results.</td>
</tr>
<tr>
<td>Social Secondary Fields</td>
<td>Fields that display additional information for each social Q&amp;A item in the search results.</td>
</tr>
<tr>
<td>Show Secondary Fields Label</td>
<td>Enable this check box to display the field labels for the additional information displayed for each result.</td>
</tr>
<tr>
<td>Pagination Type</td>
<td>Controls how additional knowledge article search results are displayed.</td>
</tr>
<tr>
<td></td>
<td>- Standard Pagination: displays the search results in multiple pages.</td>
</tr>
<tr>
<td></td>
<td>- Infinite Scroll: displays the search results while scrolling.</td>
</tr>
<tr>
<td></td>
<td>The default pagination type is set to Infinite Scroll.</td>
</tr>
<tr>
<td>Maximum no. of articles displayed per page with standard pagination</td>
<td>The maximum number of items included in a page when the search results list is displayed using standard pagination.</td>
</tr>
</tbody>
</table>
5. Click Save.

Configure filter facet widget instance options

Configure widget instance options for the filter facet widgets on the Knowledge Management Service Portal search results page.

Role required: knowledge_admin or admin

The homepage uses several widgets to filter the items in the search results list. There are two types of facet widgets:

- Simple field facets based on the Knowledge table fields
- Advanced query facets based on custom queries of the Knowledge table

Use the widget instance options to customize these facet widgets:

- Knowledge Field Facet (for filtering by knowledge base, knowledge category, and author)
- Knowledge Tags Facet (for filtering by tag)
- Knowledge Resource Facet (for filtering by resource, such as articles and social Q&A)
- Knowledge Query Facet (for filtering by rating, last modified, and number of views)

1. Navigate to the Knowledge Management Service Portal search results page.
2. Control + right-click a filter facet widget.
3. Click Instance Options.
4. Configure the desired settings for the selected type of facet widget.

<table>
<thead>
<tr>
<th>Instance option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>The title of the filter facet widget.</td>
</tr>
<tr>
<td>Glyph</td>
<td>An icon that appears to the left of the title.</td>
</tr>
<tr>
<td>Order</td>
<td>The order in which the filter facet widgets appear on the left side of the search results page. If empty, the filter facet widgets sort alphabetically.</td>
</tr>
<tr>
<td>Bootstrap color</td>
<td>The color of the filter facet widget header.</td>
</tr>
<tr>
<td>CSS</td>
<td>See widget CSS for details.</td>
</tr>
<tr>
<td>Source Table</td>
<td>The table that contains the Source Field used to provide the filter facet widget options. The default table is Knowledge (kb_knowledge).</td>
</tr>
<tr>
<td>Instance option</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Source Field</td>
<td>The field in the Source Table that provides the filter facet widget options. Field types that can be used as a source field include string, choice, integer, reference, and boolean.</td>
</tr>
<tr>
<td>Facet Identifier</td>
<td>A unique name for the custom query facet that can be used in script code.</td>
</tr>
<tr>
<td>Facet Template</td>
<td>The selected template determines the type of facet interaction.</td>
</tr>
<tr>
<td></td>
<td>Knowledge Field Facet widget templates:</td>
</tr>
<tr>
<td></td>
<td>- Single Select: users can select only one filter from this widget.</td>
</tr>
<tr>
<td></td>
<td>- Multi Select: users can select more than one filter from this widget.</td>
</tr>
<tr>
<td></td>
<td>- Dropdown Select: users can select more than one filter from a drop down menu.</td>
</tr>
<tr>
<td>Knowledge Query Facet widget templates</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Simple Query: shows a label for each facet value.</td>
</tr>
<tr>
<td></td>
<td>- Rating: shows rating stars.</td>
</tr>
<tr>
<td>Custom Template</td>
<td>A custom template that determines facet interaction and value selection.</td>
</tr>
<tr>
<td>Facet Options</td>
<td>A custom query in JSON format for the label, ID, order, and query for each facet value. Includes the table, value (encoded query), and display value (encoded query).</td>
</tr>
<tr>
<td>Order by</td>
<td>Determines the sort order of the filter options within the facet widget. The default order is label, which sorts the options in alphabetical order. For reference fields, you can also state an order from the reference field table.</td>
</tr>
<tr>
<td>Minimum results for showing filter search bar</td>
<td>The minimum number of results required to display a search bar at the top of the filter facet widget.</td>
</tr>
<tr>
<td>Minimum results for showing scroll bar</td>
<td>The minimum number of results required to display a scroll bar in the filter facet widget.</td>
</tr>
<tr>
<td>Maximum length for string field</td>
<td>Only fields whose maximum length is less than this value are allowed to be added as a filter facet.</td>
</tr>
<tr>
<td>Alternate URL Parameters</td>
<td>The names of the URL parameters used to initialize this filter facet, if it is used in the URL as a search parameter.</td>
</tr>
<tr>
<td>Instance option</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Fetch Maximum Values</td>
<td>If enabled, fetches all facet values instead of only those facets applicable for the initial load of results. Disabling this instance option can reduce the load time for the filter facet. Based on the glide.knowman.search.facet_depth property.</td>
</tr>
<tr>
<td>Show Empty Value</td>
<td>If enabled, shows an empty filter facet option that users can select to filter for articles that do not have this field set. For example, if an article does not have an assigned category, clicking the empty option lists all articles with no assigned category.</td>
</tr>
<tr>
<td>Show Only Facet Values Matching Results</td>
<td>Creates a dynamic filter facet widget that displays only those filter values that match the search results rather than showing all values. Disabling this instance option can reduce the time needed to load the filter facet data.</td>
</tr>
</tbody>
</table>

5. Click Save.

Configure a user action for the article view page

Configure a user action for the Knowledge Management Service Portal article view page.

Role required: knowledge_admin or admin

The article view page uses the Knowledge Article Content widget to provide user actions. Use the widget instance options to customize these actions.

User actions available for the article view page appear in a menu after clicking the overflow icon ( três ) in the article header. These actions enable users to flag an article, edit an article, or create an incident for an article.

1. Navigate to the Knowledge Management Service Portal article view page.
2. Control + right-click the article header.
3. Click Instance Options.
4. Configure the desired settings for the Knowledge Article Content widget.

<table>
<thead>
<tr>
<th>Instance option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bootstrap color</td>
<td>The color of the widget header.</td>
</tr>
<tr>
<td>CSS</td>
<td>See widget CSS for details.</td>
</tr>
<tr>
<td>Hide All Actions</td>
<td>Hides the user actions in the article header including the Subscribe/Unsubscribe button and the overflow icon.</td>
</tr>
<tr>
<td>Show Version Information</td>
<td>Displays version information for the selected article. Requires the Knowledge Management Advanced plugin (com.snc.knowledge_advanced).</td>
</tr>
<tr>
<td>Instance option</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Show Create Incident Action</td>
<td>Displays the Create Incident user action when a user clicks the overflow icon in the article header.</td>
</tr>
<tr>
<td>Create Incident Action Label</td>
<td>The label for the user action that appears in the overflow icon menu. The default is Create Incident.</td>
</tr>
<tr>
<td>Create Incident Action URL</td>
<td>The target URL for the Create Incident user action. If no URL is specified, the system uses the URL in the glide.knowman.create_incident_link system property.</td>
</tr>
</tbody>
</table>

5. Click Save.

Knowledge Management Service Portal navigation

Navigate to the various sections of the service portal to find the information you need.

From the homepage, navigate to:

- The search results page by entering a word or term in the search bar and pressing Enter.
- A knowledge base by clicking a knowledge base tile.
- A knowledge article by clicking the article short description in the Featured, Most Useful, or Most Viewed article lists.

From the search results page, navigate to a knowledge article or a question by clicking the short description in the search results list.

From an article view page, navigate to recent tasks, affected products, or other articles listed in the widgets to the right of the article.

Use the breadcrumb

The breadcrumb appears at the top of the Knowledge Service Portal search page and article view page. The breadcrumb displays the location of the page or article currently in view.

Click links in the breadcrumb to move to the homepage, knowledge base, or search results page.

Knowledge Management Service Portal searching

The Knowledge Management Service Portal homepage includes a search bar with type ahead search.

Users can enter a search term and press the Enter key, which redirects to the search results page. The search results include items in which the short description, content, or attached files include the search term. By default, knowledge search results include articles, pinned articles, and social Q&A.

Users can search for information on the Knowledge Management Service Portal homepage as well as filter the search results.
Search auto-correct feature

The Knowledge Management Service Portal homepage search tool also includes an auto-correct feature. When enabled, users can auto-correct a typing error in a search term by clicking one of the suggestions.

When a search term contains a misspelling, the search tool displays the search results page and includes one or more suggested terms at the top of the page under the heading Did you mean. Clicking one of these suggestions shows all of the search results that match the selected term.

Users with the system administrator role can enable this feature.

1. Navigate to System Properties Text Search.
2. Set the following properties to true:
   - Suggest alternate search spellings for knowledge or global search (glide.ts.dym.enable_spell_correct)
   - Suggest related searches for knowledge or global search (glide.ts.dym.enable_chain_suggest)
3. Click Save.

Knowledge Management Service Portal sorting

Use the sort feature on the search results list page to sort knowledge articles and social Q&A in a variety of ways.

Sort the items in a knowledge base or search results list using the Sort by options at the top of the list.

- Views: sorts by number of article views.
- Newest: sorts by the date created or updated.
- Alphabetical: sorts alphabetically by the article Short description field.
- Relevancy: sorts by relevance to the search term.

By default, the selected option sorts in descending order. Click the option again to sort in ascending order.

The system saves the last selected sort option. When you navigate away from the search results page and then return, this sort option is retained.

Sorting by language

You can also sort articles by language if the I18N: Knowledge Management Internationalization Plugin v2 (com.glideapp.knowledge.i18n2) is activated.

Activating this plugin adds a language link at the top of the search results page. To sort by language, click this link and select the desired language from the drop-down menu. The search results list displays items in the selected language.
Knowledge Management Service Portal filtering

Filter knowledge base information or a list of search results using the filter facet widgets on the search results page.

The search results page includes multiple ways to filter the results using filter facet widgets. These widgets are listed in a column on the left side of the page and can be expanded and collapsed as needed. Refine results by expanding a filter and selecting specific items. Selections appear at the top of the search results list. By default, you can filter by:

- Knowledge Base: lists the available knowledge bases
- Category: lists the available knowledge categories
- Author: lists the names of the authors for the knowledge articles included in the search results list
- Tags: lists the knowledge tags for the items in the search results list.
- Resource: lists the types of items available, such as knowledge articles and social Q&A. For social Q&A, you can also filter for unanswered and answered questions, and question with answers that have been accepted.
- Rating: lists article ratings from 0-5 stars (clicking a rating displays articles that have the selected rating and higher)
- Last Modified: lists selections based on the timing of knowledge item modifications such as Past Month or Past Week
- View Count: lists the knowledge item view counts such as More Than 50 or Less Than 10

The selections that you make filter the items displayed in the search results list. The search results list updates to display only those items that match your selections. Deleting a selection reverses the filtering in the list. The number of matching results displayed at the top of the list changes as you add and remove filters.
Clear filter selections in the following ways:

- The Clear button at the top of a filter widget clears all of the selections in that widget.
- The Clear all button at the top of the search results list clears all of the widget selections.
- Clear individual filters at the top of the search results list by clicking the X in the filter name.

Integrating new knowledge portal pages with the service portal

Using the base system service portal, access the improved version of the knowledge portal that features an enhanced landing page with multiple knowledge bases, an article view page that includes new article widgets, and the search results page that displays global knowledge search results.

To access the enhanced knowledge portal pages from the service portal, as a system administrator, you can configure the following in the service portal:

**Note:** The knowledge portal page integrations described in this section can only be performed in the base system service portal.

- Link the Knowledge header menu and the Knowledge Base tile widget to point to the new Knowledge Management Service Portal homepage.
- Configure the type ahead and global knowledge search results links that currently point to the previous version of the knowledge portal article view page to point to the new Knowledge Management Service Portal article view page.
- Add a knowledge search widget to perform a highly configurable global knowledge search in the Knowledge Management Service Portal search results page.
- Replace the Top Rated article widget with one of the new widgets provided in the Knowledge portal.

Configure the knowledge header menu and tile widget

Access the new knowledge portal home page using the Knowledge header menu and the Knowledge Base tile widget in the service portal.

Role required: admin

1. Configure the Knowledge header link to point to the knowledge portal home page.

   ![Knowledge link on service portal header](image)

   **Figure 297: Knowledge link on service portal header**

   a) Navigate to Service Portal Portals.
   b) In the Service Portals list, select the Service Portal record.
   c) In the KB home page field, enter kb_home.
   d) Click Update.

   When you click Knowledge in the service portal header menu, it takes you to the knowledge portal home page.

2. Configure the Knowledge Base tile widget to link to the knowledge portal home page.
Figure 298: Knowledge tile widget

a) Navigate to the service portal page.

b) Control + right-click the knowledge base tile widget and select Instance Options.
   The Knowledge Base form appears.

c) In the Page field, change the value from kb_view to kb_home.

d) Click Save.

When you click the Knowledge Base tile widget in the service portal page, it takes you to the knowledge portal homepage.

Configure the knowledge portal URL to link to the article view page

Use the service portal to access the new knowledge portal article view page that features type ahead search and a highly configurable search results page.

Role required: admin

You must configure the type ahead knowledge portal link and knowledge global search results link in the knowledge base search source and in the service catalog search source, to point to the Knowledge Management Service Portal article view page.

1. Configure the type ahead knowledge portal link and the knowledge global search results link in the knowledge base search source.
   a) Navigate to Service Portal Search Sources and click the Knowledge Base search source.
   b) In the Search page template field, change the following line of code from:
      "?id=kb_article_view&amp;sys_kb_id={{item.sys_id}}"
      to "?id=kb_article&amp;sys_id={{item.sys_id}}"
c) In the Data Source tab, go to the Data fetch script field and add the following line of code:

```javascript
article.url = '?id=kb_article_view&sys_kb_id=' + kb.sys_id;
```
data.article_count = kb.getRowCount();

var kbCount = 0;
while (kb.next() && kbCount < data.limit) {
    // Does user have permission to see this item?
    if (!sp.canReadRecord("kb_knowledge", kb.getUniqueValue()))
        continue;

    var article = {};
    sp.getRecordDisplayValues(article, kb, 'sys_id, number, short_description, published, text');
    article.publishedTC = kb.getValue('published');
    article.type = "kb";
    if (article.text)
        article.text = $sp.stripHTML(article.text) = "";
    article.score = parseInt(kb.ir_query_score.getDisplayValue());
    article.label = article.short_description;
    article.priority = article.short_descriptions;

    article.url = '/id=' + kb_article_view_sys_kb_id + ' + kb.sys_id';
    results.push(article);
    kbCount++;
}

sp.logSearch('kb_knowledge', data.q, kb.getRowCount());
return results;
d) Right-click the form header and click Save.

2. configure the type ahead-knowledge portal link and the knowledge global search results link in the service catalog search source.
   a) Navigate to Service Portal Search Sources and click the Service Catalog search source.
   b) In the Search page template field, change the href tag to the following:

   ```html
   <a ng-if="item.content_type == "kb"" ng-href="?id=kb_article&sys_id=::{::item.kb_article}" class="h4 text-primary m-b-sm block">
   ```
c) In the Data Source tab, go to the Data fetch script field and change the code in line 45 to the following:

```javascript
item.url = '?id=kb_article_view&sys_kb_id=' + kb.sys_id;
```
3. Click Update.
The knowledge results from type ahead and global search in the service portal point to the new knowledge portal article view page.

*Enable search on all knowledge bases* on page 1437.

**Add a knowledge search widget to the Service Portal**

Create and add a new widget to the service portal search results page to navigate to the enhanced knowledge search results page.

Role required: admin

Create and add a Search Within knowledge widget to the service portal and link it to the Knowledge global search results page.

1. **Create a new widget** named Search Within, using the following settings:

   **Table 559: Field values to create a new knowledge search widget**

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
</table>
   | HTML Template  | `<div role="list" class="list-group">  
   |                |   <span class="list-group-item active">${Search Within}</span>  
   |                |   <a role="link" class="list-group-item" ng-href="{{data.url}}">  
   |                |   ${Knowledge}</a> </div>`                                               |
   | Server Script  | `(function() {  
   |                |   var q = encodeURIComponent($sp.getParameter('q'));  
   |                |   var kb = $sp.getValue('kb_knowledge_base') || "";  
   |                |   data.url = '/sp?id=kb_search';  
   |                |   if(q)  
   |                |     data.url += "&keyword="+q;  
   |                |   if(kb)  
   |                |     data.url += "&kb_knowledge_base="+kb;  
   |                | })());`                                                                  |

2. Add the widget to the service portal search results page.
   
   a) Navigate to the service portal search page (https://<instance>.service-now.com/sp?id=search) in designer mode.
   
   b) In the Filter Widget search box, search for the Search Within widget and drag it into the container where you want the widget to appear in the service portal search results page.
The Search Within widget is added to the service portal search results page. In the service portal, when you click Knowledge in the Search Within widget, and search for a keyword, it redirects you to the knowledge global search results page.

Add knowledge quick-access widgets

Add Featured Articles, Most Useful Articles, and Most Rated Articles knowledge widgets to the service portal page.

Role required: admin

Replace the existing Top Rated knowledge widget in the service portal with one or more of the knowledge quick-access widgets.

The following knowledge quick-access widgets are available to be added to the service portal:

- Featured Articles
- Most Useful Articles
- Most Viewed Articles

1. Navigate to the service portal home page in designer mode.
2. In the Filter Widget search box, search for the widget you had created and drag it into the container in the location you want the widget to appear in the service portal home page.

Note: You can click Preview to verify the location and appearance of the newly added widget.

When you click a link in the newly added quick-access widget from the service portal, it takes you to the knowledge portal page.
Knowledge subscriptions

Subscribe to knowledge bases and knowledge articles and receive email notifications about new articles and article revisions or comments.

With the Knowledge Management knowledge subscription feature, users can subscribe to both knowledge bases and knowledge articles.

- Knowledge base owners are auto-subscribed to all articles in the knowledge bases they own. They receive email notifications when new articles are created or revised in the knowledge base.
- Knowledge authors are auto-subscribed to the articles they create. They receive email notifications when the articles they created are checked out or revised by other authors, and if the articles receive user comments.

Users can set their Knowledge notification preferences using System Settings.

- Users who subscribe to a knowledge base receive email notifications when new articles are created in the knowledge base or if the existing articles are revised.
- Users who subscribe to an article receive email notifications when the article is revised.

The knowledge subscription feature is available for both the Knowledge Management v3 user interface and the Knowledge Management Service Portal.

Activate the Knowledge Management Advanced plugin (com.snc.knowledge_advanced) to use the knowledge subscription feature. The Knowledge Management Advanced plugin activates the Subscriptions and Activity Feed Framework plugin (com.snc.activity_subscriptions).

Note: The Knowledge Management Advanced plugin is not activated by default.

If the article versioning feature is enabled, the following notifications are also sent:

- An article is checked out
- An article is revised
- A new version of an article is published

Before using the article subscription feature, the system administrator must:

1. Activate the Knowledge Management Advanced plugin.
2. Configure the knowledge subscription properties.
3. If necessary, customize the article subscription email notification templates.

Configure knowledge subscription properties

These properties enable the knowledge subscription feature, identify the roles that can use the feature, and identify the article states that generate notifications.

Role required: knowledge_admin or admin

1. Navigate to Knowledge Administration Properties.
2. In the KM Subscription Properties section, configure the following properties.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable subscribe feature for KM</td>
<td>Enables or disables the Knowledge Management knowledge subscriptions feature.</td>
</tr>
</tbody>
</table>
Property | Description
---|---
List of roles (comma-separated) who can have subscription feature | A comma-separated list of the roles that can use the knowledge subscriptions feature and subscribe to knowledge bases and articles.

**[glide.knowman.enable_km_subscription.roles]**

List of workflow states (comma-separated) that can have subscription feature | A comma-separated list of the article states for which the knowledge subscription feature is available. The default states include Draft, Review, and Published.

**[glide.knowman.enable_km_subscription.workflow_state]**

3. **Click Save.**

**Knowledge subscription email notification templates**

The knowledge subscription feature uses email notification templates to send subscription notifications to knowledge users.

<table>
<thead>
<tr>
<th>Email template</th>
<th>Subscription type</th>
</tr>
</thead>
<tbody>
<tr>
<td>KM Subscription: Article created</td>
<td>Knowledge base</td>
</tr>
<tr>
<td>KM Subscription: Article revised in KB</td>
<td>Knowledge base</td>
</tr>
<tr>
<td>KM Subscription: Article checked out</td>
<td>Knowledge article</td>
</tr>
<tr>
<td>KM Subscription: Article revised</td>
<td>Knowledge article</td>
</tr>
<tr>
<td>KM Subscription: Article commented</td>
<td>Knowledge article</td>
</tr>
</tbody>
</table>

Users with the admin or knowledge_admin role can customize these email notification templates. To locate the template, navigate to System Notifications Email Notifications. For more information about customizing a template, see [Create an email notification](#). Subscriptions notifications include a link at the bottom of the email to the user's Notification Preferences page.

**Subscribe to a knowledge base**

Subscribe to a knowledge base and receive notifications when articles are added to that knowledge base.

Role required: knowledge

Users can subscribe to a knowledge base from either the Knowledge Management v3 user interface or the Knowledge Management Service Portal.

1. **Navigate to Knowledge Homepage.**
2. **Click the Subscribe link on the knowledge base tile.**
   The link changes to Subscribed and includes a check mark.

**Subscribe to a knowledge article**

Subscribe to a knowledge article within a knowledge base.

Role required: knowledge

Users can subscribe to a knowledge article from either the Knowledge Management v3 user interface or the Knowledge Management Service Portal.
Note:
Users who are already subscribed to a knowledge base are also subscribed to the articles within that knowledge base.

To subscribe to articles from the base service portal (https://<instance name>/sp?), you must navigate to the Knowledge Management Service Portal pages (for example: https://<instance name>/sp?id=kb_home) from the base service portal.

1. Navigate to Knowledge Homepage.
2. Click Subscribe at the top of the knowledge article.
   The system displays an information message about the article subscription and the button toggles to Subscribed.

Unsubscribe from a knowledge base
Unsubscribe from a knowledge base.
Role required: knowledge

Users can unsubscribe from a knowledge base from either the Knowledge Management v3 user interface or the Knowledge Management Service Portal.

Note: If you subscribe to an article and then subscribe to the knowledge base, unsubscribing from the knowledge base also unsubscribes you from the article.

1. Navigate to Knowledge Homepage.
2. Point to and click the Subscribed link on the knowledge base tile, which toggles to Unsubscribe.
   After unsubscribing you from the knowledge base, the link toggles to Subscribe.

Unsubscribe from a knowledge article
Unsubscribe from a knowledge article.
Role required: knowledge

Users can unsubscribe from a knowledge article from either the Knowledge Management v3 user interface or the Knowledge Management Service Portal.

Note: If you are subscribed to a knowledge base and you unsubscribe from an article in that knowledge base, you must also unsubscribe from the parent knowledge base.

1. Navigate to Knowledge Homepage.
2. Point to and click Subscribed, which toggles to Unsubscribe.
   If you are subscribed to the knowledge article, this action results in an information message that the article subscription has been removed. If you are also subscribed to the parent knowledge base, proceed to the next step.
3. If you are subscribed to the parent knowledge base, click Yes on the Unsubscribe pop-up window.
   This action results in an information message that the knowledge base subscription has been removed.
Set knowledge subscription notification preferences

Set notification preferences for knowledge bases and knowledge articles.

Role required: knowledge

Users can set notification preferences from the Knowledge menu or from the Knowledge Management Service Portal.

1. Navigate to the Notification Settings page.

<table>
<thead>
<tr>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>From the Knowledge application</td>
<td>Click the Notification Settings module.</td>
</tr>
<tr>
<td>From the Knowledge Management Service Portal</td>
<td>Click the user name in the portal header and then click Notification Settings.</td>
</tr>
</tbody>
</table>

2. Click the Notification Preferences tab.
3. Click Knowledge Base and enable or disable the knowledge base notification options.
4. Click Knowledge Articles and enable or disable the knowledge article notification options.

Manage knowledge subscriptions

Manage knowledge base and knowledge article subscriptions from the Notification Settings page.

Role required: knowledge

Users can manage knowledge subscriptions from the Knowledge application or from the Knowledge Management Service Portal.

1. Navigate to the Notification Settings page.

<table>
<thead>
<tr>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>From the Knowledge application</td>
<td>Click the Notification Settings module.</td>
</tr>
<tr>
<td>From the Knowledge Management Service Portal</td>
<td>Click the user name in the portal header and then click Notification Settings.</td>
</tr>
</tbody>
</table>

2. Click the Subscriptions tab.
3. Click Knowledge Base or Knowledge Articles to see a list of current subscriptions.
4. To unsubscribe from a knowledge base or knowledge article, click Subscribed. The link toggles to Unsubscribed.

Article quality index for knowledge management

Assess the quality of knowledge articles with the article quality index (AQI). The AQI helps maintain consistent quality of knowledge articles attached to a knowledge base where articles are written by various authors.

Using AQI feature, a knowledge administrator (a user with knowledge_admin role) creates a checklist and adds a set of true or false questions to the checklist to assess the quality of knowledge articles. For each question, the knowledge_administrator assigns a weight based on its importance to the quality measurement and then attaches the checklist to a knowledge base.

A knowledge reviewer (a user with knowledge_coach and knowledge_domain_expert role) performs AQI review on knowledge articles attached to the knowledge base by answering the true or false questions in the checklist. The article quality is then scored based on the cumulative weight of all answers set to true in the checklist.
Activating article quality index

The article quality index feature is activated with the Knowledge Management Advanced (com.snc.knowledge_advanced) plugin. For details see, *Activate the Knowledge Management Advanced plugin* on page 1378.

Create an AQI checklist

Create a checklist of questions that reviewers can use to evaluate the quality of knowledge articles.

Role required: knowledge_admin or admin

1. Navigate to Knowledge Article Quality Index AQI checklists, and click New.
2. Fill in the following fields:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Checklist</td>
<td>Name for the checklist.</td>
</tr>
<tr>
<td>Description</td>
<td>Description for the checklist.</td>
</tr>
</tbody>
</table>

3. Right-click the form header and click Save.
4. In the Checklist Questions related list, add questions to the checklist.

Add questions and adjust the weight of the questions until the combined weight of all questions is equal to 100. The weight defines the score that is added to the total AQI review score of the article when the answer for that question is set to true. The maximum score that can be applied to an article in an AQI review is 100.

**Note:** The default AQI pass score is 70. You can change the pass score in the Article Quality Index properties.

To add a question:

a) Click New.

b) Fill in the following fields:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question</td>
<td>Text for the question to evaluate articles.</td>
</tr>
<tr>
<td>Description</td>
<td>Short description for the question.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| Order  | Value for the display order of questions in the checklist. The lower the value in the Order field, the higher the question displays in the checklist.  

**Note:** Before you assign a value for the display order, think about how many questions you would create for the checklist. For example, if you have five questions in a checklist, you can assign the value in increments of 20. This ensures that you have enough values to assign if you add questions to the checklist later. |
| Weight | A value for the question to score the article quality. This value is added to the AQI score when the answer for the question is set to true.  

**Note:**  
- The combined weight of all questions cannot exceed 100.  
- The sum of weights of all questions in a checklist must be equal to 100 to be assigned to a knowledge base. |

c) Click Submit.

5. After you finish adding questions to the checklist, click Update on the AQI Checklist form.

After you create a checklist, [assign it to a knowledge base](#).

**Assign an AQI checklist to a knowledge base**

Before a knowledge reviewer can start performing the AQI review, you must assign an AQI checklist to a knowledge base.

You can only assign a checklist to a knowledge base when the weight of all questions in the checklist is equal to 100. Each knowledge base can have one assigned checklist. However, a checklist can be assigned to more than one knowledge base.

Role required: knowledge_admin or admin
1. Navigate to Knowledge Administration Knowledge Bases.
2. Click a knowledge base to which you want to assign a checklist.
3. On the Knowledge Base form, click the search icon in the Checklist field and select the AQI checklist to apply.
4. Click Update.

After you assign an AQI checklist to a knowledge base, you can start performing AQI reviews.

### Remove an AQI checklist from a knowledge base

Before you can edit a checklist that is assigned to a knowledge base, you must remove it from the knowledge base.

A checklist with pending AQI reviews cannot be removed from the knowledge base until all AQI reviews associated with the checklist are complete.

Role required: knowledge_admin or admin

1. Navigate to Knowledge Administration Knowledge Bases.
2. Click a knowledge base from which you want to remove a checklist.
3. On the Knowledge Base form, delete the name of the AQI checklist from the Checklist field.
4. Click Update.

### Delete questions from an AQI checklist

Deleting a question in a checklist deletes the text in the question of previously performed AQI reviews that use the checklist. Deleting an AQI question from a checklist will not affect the score of the previously performed AQI reviews. However, the text of the question will not be displayed in the checklist.

You can delete questions from a checklist if the following conditions are met:

- The checklist is not attached to a knowledge base. For more information, see Remove an AQI checklist from a knowledge base on page 1505.
- There are no AQI reviews using the checklist in progress.

Role required: admin

1. Navigate to Knowledge Article Quality Index AQI checklists.
2. Click the AQI checklist from which you want to delete one or more questions.
3. In the Checklist Questions related list, select the check box next to the questions that you want to delete.
4. From the Actions on Selected Rows choice list, select Delete.
5. In the Confirmation window, click Delete.

### Perform an AQI review

Perform the AQI review to evaluate the quality of the article.

The knowledge base must have an assigned AQI checklist.

Role required: knowledge_domain_expert, knowledge_coach, knowledge_admin, or admin

Configure the glide.knowman.aqi.article_workflow_states property to set the article workflow states where you could perform AQI reviews. You can perform several AQI reviews for an article. If you perform several
AIOI reviews for the same version of the article, the latest AIOI score appears in the Latest AIOI field in the article.

1. Navigate to Knowledge Articles Published, and click on an article to perform the AIOI review.
2. Perform one of the following actions:

<table>
<thead>
<tr>
<th>Option</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>The AIOI review is not yet started.</td>
<td>Click Perform AIOI in the form header.</td>
</tr>
<tr>
<td>The AIOI review was started and is pending.</td>
<td>Click Continue AIOI in the form header.</td>
</tr>
</tbody>
</table>

An Article Checklist Summary form appears.

3. In the Article Checklist Answers related list, read the questions and evaluate which ones are true. Double-click the Answer cell for each question that is true, select true, and click the green check mark.

   **Note:** The associated Weighted Score is applied to the AIOI score when the answer is set to true.

4. Perform one of the following actions:
Submit the completed AQI review.

<table>
<thead>
<tr>
<th>To</th>
<th>Do This</th>
</tr>
</thead>
</table>
| To submit the completed AQI review. | Click Submit. The form refreshes and the total score of the AQI review is displayed in the AQI score field. The system sends an email notification as follows:  
  • If the AQI review was performed on the first version of the article, the system sends an email notification to the author of the article.  
  • If the AQI review was performed on subsequent versions of the article, the system sends an email notification to the author and creator of the article versions.  
  Note: The notification includes the AQI review score and AQI review result. You can customize the content and design of the notification emails. |

Save the pending review to complete later.

<table>
<thead>
<tr>
<th>To</th>
<th>Do This</th>
</tr>
</thead>
<tbody>
<tr>
<td>To save the pending review to complete later.</td>
<td>Click Update and return to the Article Checklist Summaries list. The checklist with pending reviews is added to the My Pending AQI Checklists queue. When you want to complete the AQI reviews, navigate to Knowledge My Pending AQI Checklists and complete the reviews.</td>
</tr>
</tbody>
</table>

To view all the AQI reviews you completed, navigate to Knowledge My Completed AQI Checklists.

View all pending and completed AQI reviews

View checklists of all users to monitor the pending and completed reviews.  
Role required: knowledge_admin or admin  
1. Navigate to Knowledge Article Quality Index  
2. Do one of the following:  
   • To view all completed AQI checklists, select All Completed AQI Checklists.  
   • To view all pending AQI checklists, select All Pending AQI Checklists

Knowledge article templates

Article templates have pre-defined fields structured in a specific order. These templates help create a consistent structure for knowledge articles.  
Using the Knowledge Article Templates feature, as a knowledge administrator (a user with knowledge_admin role), you can create article templates, add or customize fields in a template, and activate or deactivate a template.
As a security administrator (a user with security_admin role), you can configure field-level security in any template to make it visible to specific users.

As an author, you can create articles using pre-defined article templates or any newly created article templates.

**Pre-defined knowledge article templates**

Use either the Standard template or one of the pre-defined How To, What Is, FAQ or KCS article templates.

---

**Note:**

When you upgrade from a previous release version of Knowledge Management, all existing articles from that release version automatically use the Standard template.

All pre-defined templates are inactive by default. If you do not activate a template, the articles automatically use the Standard template. As a knowledge admin, you can activate a template by navigating to Knowledge Administration Article Templates. Then in the article template list, set the Active field to true for one or more templates you would like to activate.

The table below lists the fields available in each template and the name of the template table.

---

### Table 561: Pre-defined knowledge article templates

<table>
<thead>
<tr>
<th>Template name</th>
<th>Template fields</th>
<th>Maps to table</th>
<th>SEO Description Tag</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAQ</td>
<td>• Question</td>
<td>FAQ [kb_template_faq]</td>
<td>Question</td>
</tr>
<tr>
<td></td>
<td>• Answer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>How To</td>
<td>• Introduction</td>
<td>How To [kb_template_how_to]</td>
<td>Introduction</td>
</tr>
<tr>
<td></td>
<td>• Instructions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What Is</td>
<td>• Introduction</td>
<td>What Is [kb_template_what_is]</td>
<td>Introduction</td>
</tr>
<tr>
<td></td>
<td>• Explanation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KCS Article</td>
<td>• Issue</td>
<td>KCS Article [kb_template_kcs_article]</td>
<td>Issue</td>
</tr>
<tr>
<td></td>
<td>• Environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Cause</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Resolution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard</td>
<td>Text</td>
<td>kb_knowledge</td>
<td>Text</td>
</tr>
</tbody>
</table>

---

**Activating knowledge article templates**

The Knowledge Article Templates feature is activated with the Knowledge Management Advanced (com.snc.knowledge_advanced) plugin. For details, see *Activate the Knowledge Management Advanced plugin* on page 1378.

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Create an article template

Create new article templates in addition to the pre-defined templates. Add new fields based on how you want to customize and display your content.

Role required: knowledge_admin or admin

For each new article template, a child table of the Knowledge [kb_knowledge] table is created. When you add a new field to the template, a new column is added to that table created for the template.

1. Navigate to Knowledge Administration Article Templates, and click New.
2. Fill in the following fields:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name for the article template.</td>
</tr>
<tr>
<td>Description</td>
<td>Description for the article template.</td>
</tr>
<tr>
<td>SEO Description Tag</td>
<td>Article template field name. The content in this field is used as meta description tags to search for articles created using this article template.</td>
</tr>
</tbody>
</table>

The Active check box is selected by default making the template available for use.

3. Right-click the form header and click Save.
4. In the Article Templates Field related list, add fields to the template.

To add a field:

a) Click New.
b) Fill in the following fields as required:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Name</td>
<td>Title to display on the template form.</td>
</tr>
<tr>
<td>Field Type</td>
<td>Available field types:</td>
</tr>
<tr>
<td></td>
<td>• HTML</td>
</tr>
<tr>
<td></td>
<td>• String</td>
</tr>
<tr>
<td></td>
<td>• Integer</td>
</tr>
<tr>
<td></td>
<td>• Date</td>
</tr>
<tr>
<td></td>
<td>• Date and time</td>
</tr>
<tr>
<td>Order</td>
<td>Position of the field in the article page view and the article edit view.</td>
</tr>
<tr>
<td>Article Template</td>
<td>(Read-only) Name of the article template associated with this field.</td>
</tr>
<tr>
<td>Template Table</td>
<td>(Read-only) Name of the table for this template.</td>
</tr>
<tr>
<td>Template Field</td>
<td>(Read-only) Name of the template column associated with this field.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>If checked, this field is mandatory.</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>Active</td>
<td>If checked, this field displays in the template.</td>
</tr>
</tbody>
</table>

c) Click Submit.

The field is added to the template.

5. Configure the article template form to display the fields that you added to the template.

   **Note:** You must have the admin role to configure the form layout. If the field is not available in the form layout, use the form designer to configure the fields.

a) Navigate to Knowledge Articles Create New.
b) Select the template in which you want to display the fields.
c) Right-click the header and select Configure Form Layout
d) Select and move the required fields from the Available to the Selected list.
e) Click Save.

   **Note:** Authors who started a session before a template was created or activated will see the newly added template upon their next login.

Restrict access to fields in an article template

Use encryption context to set field-level security in article templates and display the fields based on user permissions.

Activate the Encryption Support plugin to enable field-level security using encryption context.

Role required: security_admin

2. In the Name field, enter a name for the encryption context and click Submit.
3. Set the Type field for a table to Encrypted Text.
   To set the Type field for a table to Encrypted text:
   a) Navigate to System Definition Dictionary.
   b) Select the table to set the Type field to Encrypted Text.
   c) In the Type field, select Encrypted Text.
   d) Click Update.

The field is configured for encryption context.

4. Configure roles that can view the fields configured for encryption context.
   To configure the roles that can view the fields:
   a) Navigate to User Administration Roles and select the role you want to assign permissions to view this field.
   b) In the Encrypted context field, select the name of the encryption context to apply for this role.
Generate SEO information for articles using article templates

Improve the searchability of knowledge articles by using the content in an article template field to generate SEO tags for articles created using that template.

Role required: knowledge_admin or admin

Note: If you are using the Standard article template, the content of the Text field is used to generate the tags.

You can define the number of characters to be used as tags in the glide.knowman.seo.pages.meta_description.length system property.

1. Navigate to Knowledge Article Templates.
2. Select an article template.
3. In the SEO Description Tag field, select an article template field.
4. Click Update.

Note: You can change which article template field is used for generating SEO. Changes are applied only to knowledge articles created or updated after the change was made. To apply the update to all existing published articles created using this template, run the Populate Meta Description on KB Articles fix script.

Integration with external knowledge sources

Use the external content integration feature to integrate content from various external sources and enable unified knowledge search results.

Users store and manage knowledge using various external sources and search each source separately for relevant results. External content integration enables acquiring and searching all WebDAV-compliant source content from a single location. This provides users with a seamless search experience across multiple knowledge sources and drives more usage to the platform.

Using this feature, knowledge administrators can define the external content to be imported into a knowledge base and periodically run a job to import the content. Knowledge users have a seamless user experience searching for relevant content across multiple knowledge sources.

Activate the External Content Integration plugin

The External Content Integration feature is activated with the Knowledge Management - External Content Integration plugin (com.snc.knowledge.external_integration).

Role required: admin

The Knowledge Management - External Content Integration plugin is not active by default.

The following plugins are automatically activated when the Knowledge Management - External Content Integration plugin is activated:

• Centralized Connection and Credentials plugin (com.snc.core.automation.connection_credential)
- **Knowledge Management V3 plugin** (com.snc.knowledge3)
- **Knowledge Management Advanced Installer plugin** (com.snc.knowledge_advanced.installer)

The Knowledge Administration module displays the External Knowledge Sources and External Knowledge Jobs sub-modules when the Knowledge Management - External Content Integration plugin is activated.

1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.
   
   If the plugin depends on other plugins, these plugins are listed along with their activation status.

   If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).

4. If available, select the Load demo data check box.
   
   Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.

   You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.

5. Click Activate.

Define an external knowledge source

Before you import content, create and configure the connection between the a Web Distributed Authoring and Versioning (WebDAV) - compliant external knowledge source and the ServiceNow knowledge base into which you want to import content. Define import parameters for the external knowledge source.

Define **basic authentication credentials** and create an **HTTP connection** to the external source.

---

**Caution:** This feature expects that the external source endpoint is a publicly accessible endpoint. Mid-server configuration is not supported.

Role required: admin

1. Define the connection from the external source and the target knowledge base.
   a) Navigate to Knowledge Administration External Knowledge Sources.
   b) Click New.
   c) Fill in the following fields:

<table>
<thead>
<tr>
<th>Field</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter unique name for the external source.</td>
</tr>
<tr>
<td>Target Knowledge Base</td>
<td>Select the knowledge base in which you want to create articles for the external content.</td>
</tr>
<tr>
<td>Connection Alias</td>
<td>Select the connection alias to connect to the external source.</td>
</tr>
</tbody>
</table>
d) Right-click the form header and click Save.

2. Set import parameters for the external content.
   a) In the Parameter related list, click New.
   b) In the Name field, select the name of the parameter from the drop-down list.
   c) In the Value field, enter the desired value for the parameter.

   The table below lists the parameters and the corresponding values that can be set for the external source.

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum size limit (in MB) for this source</td>
<td>Set maximum allowed content size for this source. Once this limit is reached, no further content is processed. Default value is 400 MB.</td>
</tr>
<tr>
<td>Maximum size limit (in KB) per file/content in this source</td>
<td>Set maximum allowed size limit for each file from this external source. If a file exceeds this limit, that file is not processed. Default value is 4000 KB.</td>
</tr>
<tr>
<td>Open search results in the original source system</td>
<td>Set value to true to open search results in the external source system. Set value to false to open search results in the target knowledge base. Default value is set to false.</td>
</tr>
<tr>
<td>Include folders with names that match these regex patterns</td>
<td>Enter a comma-separated list of regular expressions for folder names that need to be included from this external source.</td>
</tr>
<tr>
<td>Exclude folders with names that match these regex patterns</td>
<td>Enter a comma-separated list of regular expressions for folder names that need to be excluded from this external source.</td>
</tr>
<tr>
<td>Create articles when file names match these regex patterns</td>
<td>Enter a comma-separated list of regular expressions for file names that need to be included to create articles.</td>
</tr>
<tr>
<td>Do not create articles when file names match these regex patterns</td>
<td>Enter a comma-separated list of regular expressions for file names that need to be excluded to create articles.</td>
</tr>
<tr>
<td>Maximum retry limit</td>
<td>Maximum number of retries to send request to the external source.</td>
</tr>
</tbody>
</table>

d) Click Submit.

Import content from an external knowledge source

Run an import job manually or set up a schedule to process the integrated external content.

Role required: admin or knowledge_admin
Each external source is associated with two handlers: the Acquire handler and the Process handler, for running the import job. The acquire handler uses a WebDAV client to acquire external content to create articles. You can customize the process handler to assign categories to articles or populate additional metadata for the knowledge articles.

1. Navigate to Knowledge Administration External Knowledge Sources.
2. Select the external knowledge source from which you would like to import content.
3. In the Handler tab, set a schedule to run the acquire and process handlers.
4. In the Related Links section, click Run Scheduled Job.
5. To view all jobs scheduled to run to import content for the external source, click the Jobs.
   You can open the most recent job to monitor the status.

Open knowledge search results in source system

Configure the URL to the external source system to open articles from search results directly in the source system.

Make sure the Open search results in the original source system import parameter for the external knowledge source is set to true.

Role required: admin

1. Navigate to System Definition Script Includes.
2. Open KBWebDAVContentHandler.
3. In the Script window, override the function getFileURL using script shown below.
   The getFileURL function is shown below.
   ```javascript
   getFileURL: function(fileObj) {
     //write your logic here
   },
   ```
4. Click Update.

Sample configuration for integrating external knowledge content

You can integrate content from multiple external sources so your users can acquire and search knowledge from a single location. Use this sample configuration to create a connection to your external account, configure external knowledge sources, and import content to enable search results for unified content.

Requirements for integrating external content

Make sure the Knowledge Management -- External Content Integration plugin (com.snc.knowledge.external_integration) is enabled and your external source is WebDAV compliant.
Integrate external knowledge sources into the Knowledge Management application

Create authentication credentials and a connection alias to connect your external knowledge source to the ServiceNow Knowledge Management application. Define import parameters for your external source to import integrated content.

Role required: admin

1. Enable basic authentication on your external account.

   **Note:** Your external account password is not affected when you enable basic authentication.

2. Create the connection to your external account using the basic authentication credentials.
   a) Navigate to Connections and Credentials Credentials .
   b) Click New.
   c) Click Basic Auth Credentials.
      Fill in the following fields:

      | Field       | Description                                      |
      |-------------|--------------------------------------------------|
      | Name        | Name for the credential. For example, Demo_Auth. |
      | User name   | The external account user name created for basic authentication. |
      | Password    | The external account password for the user name. |

   d) Click Submit.

3. Create an HTTP connection to your external account.
   a) Navigate to Connections & Credentials Connection & Credential Aliases .
   b) Select New.
   c) In the Name field, enter the name of the connection alias. For example, Demo_Account.
   d) Right-click the form header and click Save.
   e) In the Connections related list, click New.
      Fill in the following fields:

<pre><code>  | Field   | Description                                                      |
  |---------|-----------------------------------------------------------------|
  | Name    | Name for the HTTP connection. For example, Demo_Connection.      |
  | Credential | Credential created to connect to the external account. For example, Demo_Auth. |
</code></pre>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection URL</td>
<td>WebDAV URL to your external account. This is the WebDAV end point of your external account.</td>
</tr>
</tbody>
</table>

**Note:** You can also import contents from a specific folder by appending the folder path to the URL. For example, https://<web link to your external_account>/KnowledgeIT.

f) Click Submit.

4. Configure the external knowledge source for importing content.
   a) Navigate to Knowledge Administration External Knowledge Sources.
   b) Click New and fill in the following fields:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Unique name for the external source. For example, Demo_knowledge.</td>
</tr>
<tr>
<td>Target Knowledge Base</td>
<td>Knowledge base in which you want to create articles for the external content. For example, IT.</td>
</tr>
<tr>
<td>Connection Alias</td>
<td>Connection alias to connect to the external source. For example, Demo_Account.</td>
</tr>
</tbody>
</table>

   c) Right-click the form header and select Save.
   d) In the Parameter related list, click New.
   e) On the Parameter form, select the name of the import parameter that you want to configure for your external source and then set the value for the parameter.

   The table below lists the parameters and the corresponding values that can be set for the external source.

<table>
<thead>
<tr>
<th>Parameter name</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum size limit (in MB) for this source</td>
<td>Maximum allowable content size to import from your external source. For example, 250 MB.</td>
</tr>
<tr>
<td>Maximum size limit (in KB) per file/content in this source</td>
<td>Maximum allowable size for each article, including attachments, that you can import from this external source. For example, 2000 KB.</td>
</tr>
<tr>
<td>Open search results in the original source system</td>
<td>Opens search results in the external source system if this value is set to true.</td>
</tr>
<tr>
<td>Include folders with names that match these regex patterns</td>
<td>Comma-separated list of regular expressions for folder names to include from this external source. For example, to include all folders names that start with the letters a and b, enter a.<em>,b.</em>.</td>
</tr>
</tbody>
</table>
### Parameter name | Value
--- | ---
Exclude folders with names that match these regex patterns | Comma-separated list of regular expressions for folder names to exclude from this external source. For example, to exclude all folders names that start with the letters a and b, enter `a.*,b.*`.  

Create articles when file names match these regex patterns | Comma-separated list of regular expressions for file names that to include when creating articles. For example, to include all file names have `.docx` and `.pdf` extensions, enter `.*\docx,.*\.pdf`.  

Do not create articles when file names match these regex patterns | Comma-separated list of regular expressions for file names to exclude when creating articles. For example, to exclude file names have `.docx` and `.pdf` extensions, enter `.*\docx,.*\.pdf`.  

Maximum retry limit | Maximum limit for the number of times a connection request can be sent to the external source. For example, 5.

---

*Import content from an external knowledge source.*

Automating feedback management to improve content

Manage high volumes of article feedback by enabling task generation for negative feedback. When an article is rated poorly or marked as unhelpful, a feedback task is generated and assigned to the author or reviser of the article.

The task assignee can update the article, create a new article, request additional feedback, or reassign the task and receives notification after the feedback is updated or resolved.

**Note:** Feedback tasks are only generated if feedback is given on the Knowledge Service Portal.

Enable actionable knowledge feedback

The actionable knowledge feedback feature is available when the Knowledge Management-Service Portal (com.snc.knowledge_serviceportal) plugin is activated and the actionable knowledge feedback properties are enabled.

Role required: admin

Refer to [Knowledge Management Advanced plugin](#) and [Knowledge Management - Service Portal plugin](#) sections on how to activate the plugins.

By default, negative article feedback does not automate the triggering of feedback tasks. You must configure these properties to generate feedback tasks when an article is marked as not helpful or rated below a set value.

1. Navigate to Knowledge Administration Properties.
2. In the Actionable Feedback Properties section, configure the following properties:
Create actionable feedback task when an article is marked as not helpful.

Enter a value from 1 to 5 to specify the rating threshold for generating a feedback task. For example, if you set this value to 3, a feedback task is generated when a user selects three or less stars to rate an article.

**Note:** If you enter '0', a negative article feedback does not generate a feedback task.

<table>
<thead>
<tr>
<th>Property</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create actionable feedback task when an article is rated at or lower than this value. 0 or no value indicates that actionable feedback tasks are not enabled for Rating type feedback.</td>
<td>Enter a value from 1 to 5 to specify the rating threshold for generating a feedback task. For example, if you set this value to 3, a feedback task is generated when a user selects three or less stars to rate an article. <strong>Note:</strong> If you enter '0', a negative article feedback does not generate a feedback task.</td>
</tr>
</tbody>
</table>
Change the feedback task state to | If you want to
--- | ---
**Awaiting information** | Request clarification from the feedback submitter. 
In the Additional Comments field, enter information you need from the submitter and click Update. This triggers an email notification for the feedback task submitter.

**Resolved** | Resolve the feedback task. 
In the Resolution Code field, select the code for resolving the article. In the Resolution notes field, enter the reason for the resolution and click Update. An email notification is sent to the feedback submitter to accept or reject the feedback.

**Closed** | Close the feedback task without the submitter having to accept the feedback resolution.

**Note:** If the submitter accepts the feedback resolution, the state for the feedback task is automatically set to Closed. You can view all closed feedback tasks in your queue by navigating to Knowledge Feedback Management My Closed Tasks.

---

**Track the progress on a feedback task**

Monitor open and closed feedback tasks and track the duration of time a feedback task remains in each state.

**Role required:** Owner of the knowledge base, knowledge_manager, knowledge_admin, or admin

1. Navigate to the open or closed tasks you want to track.

<table>
<thead>
<tr>
<th>To</th>
<th>Navigate to</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>View open feedback tasks</strong></td>
<td>Knowledge Feedback Management All Open Tasks and select a feedback task.</td>
</tr>
<tr>
<td><strong>View closed feedback tasks</strong></td>
<td>Knowledge Feedback Management All Closed Tasks and select a feedback task.</td>
</tr>
</tbody>
</table>

2. In the Knowledge Feedback Task Metrics related list section, select a feedback task metric to view the start and end time and the duration of the feedback task.

**Note:** If you are a knowledge administrator, you can view the feedback tasks and task metrics of articles in the knowledge bases. If you are a knowledge owner or knowledge manager, you can view feedback tasks and task metrics of all articles in the knowledge bases you own or manage.

---

**Knowledge blocks**

Knowledge blocks are reusable pieces of content secured by user criteria that you can add to knowledge articles in a knowledge base. The user criteria controls which users can read or not read the block content.
in an article or search. Knowledge blocks enable enterprise organizations to simplify knowledge authoring for writers and knowledge consumption for readers.

**How to use knowledge blocks**

To use knowledge blocks, a knowledge administrator or manager must enable the knowledge blocks feature for each knowledge base where the blocks will be used.

- *Enable knowledge blocks for each knowledge base* on page 1522

Knowledge contributors can create knowledge blocks and insert them into articles in a knowledge base:

- *Create a knowledge block* on page 1523
- *Add knowledge blocks to a knowledge article* on page 1528

Knowledge block content can be read or not read in an article or search, based on user criteria set at the knowledge base and knowledge block level. See *Select user criteria for a knowledge block* on page 1525 for more information.

**Knowledge blocks for location-specific content**

An enterprise HR organization wants to provide a holiday calendar for employees in the company knowledge base. Since employees in the company work from many different locations, the holiday dates vary. There are several ways that HR could create the calendars.

One way is that HR could create a knowledge article for each location, with an article for Location A, Location B, and so on.

- **Pros:** simplified consumption. Employees have a single article to search for and read.
- **Cons:** more work for HR. HR has multiple articles to manage and update for each location where the company has employees.

Another way is that HR could create a single article that includes sections for each location.

- **Pros:** simplified authoring. HR has a single article to manage and update.
- **Cons:** more work for employees. Employee must scroll through and disregard extraneous content to find the section in the article that pertains to them.

With knowledge blocks, HR can create a single article with location-specific block content secured by user criteria. This approach helps to reduce the workload for both HR and employees. HR has a single article to manage and update. Employees have a single article to search for and read, with the user criteria ensuring that they only view content that is relevant to them.

**If you are using a custom search or knowledge article viewer**

If you are using a custom search or knowledge article viewer with your application, you should integrate it with the appropriate knowledge or knowledge blocks API. (Integration is only necessary if you are using a custom search or knowledge article viewer.)

- *Integrating a custom search or knowledge article viewer with knowledge blocks* on page 1533
Activation information

To use knowledge blocks in your application, you must activate knowledge blocks. For information on what components are installed with the feature, see Components installed with knowledge blocks on page 1522.

Note: Activating knowledge blocks automatically activates Knowledge Management Advanced, which enables advanced features such as article versioning. Knowledge blocks can be used with or without the article versioning feature. To disable the feature, see Disable the article versioning feature on page 1460.

Activate knowledge blocks

You can activate knowledge blocks [com.snc.knowledge_blocks] if you have the admin role. This plugin includes demo data and activates related plugins if they are not already active.

Role required: admin

Knowledge blocks activates these related plugins if they are not already active.

Table 562: Plugins for knowledge blocks

<table>
<thead>
<tr>
<th>Plugin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Management Advanced [com.snc.knowledge_advanced]</td>
<td>Enables advanced features for Knowledge Management, such as article versioning. For a full list of features, see activate the Knowledge Management Advanced plugin.</td>
</tr>
</tbody>
</table>

Note: Knowledge blocks can be used with or without the article versioning feature. To disable the feature, see Disable the article versioning feature on page 1460.

1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.
   - If the plugin depends on other plugins, these plugins are listed along with their activation status.
   - If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).
4. If available, select the Load demo data check box.
   - Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.
   - You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.
5. Click Activate.
Components installed with knowledge blocks

Several types of components are installed with activation of the knowledge blocks plugin, including tables.

**Note:** To view all other components installed with this plugin, see the Application Files table. For instructions, see *Find components installed with an application*.

Demo data is available for this feature.

### Tables installed

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Block [kb_knowledge_block]</td>
<td>Knowledge blocks table.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This table extends the Knowledge [kb_knowledge] table.</td>
</tr>
<tr>
<td>KB Knowledge to Block [m2m_kb_knowledge_to_block]</td>
<td>KB knowledge to block table.</td>
</tr>
<tr>
<td>KB Knowledge to Block History [m2m_kb_to_block_history]</td>
<td>KB knowledge to block history table.</td>
</tr>
</tbody>
</table>

### Enable knowledge blocks for each knowledge base

Enable the knowledge blocks feature for each knowledge base where you plan to use the blocks. Once enabled, you can create knowledge blocks to add to knowledge articles within a knowledge base.

Role required: knowledge_admin or knowledge_manager

1. Navigate to Knowledge Administration Knowledge Bases.
2. Open the knowledge base record.
3. In the Knowledge Base form, select the Enable blocks check box.

**Note:** If the Enable blocks check box is not visible, you can add the field to the form by right-clicking the form header and navigating to Configure Form Layout.
4. Click Update.

**Note:** If you decide to later disable the knowledge blocks feature, all knowledge blocks within the knowledge base must be deleted before you can clear the box.

If there are more knowledge bases that require the knowledge blocks feature, repeat the process. Otherwise, you can create knowledge blocks for use within the enabled knowledge base.

Create a knowledge block

As a knowledge contributor, you can create or modify a knowledge block within a knowledge base. The block is secured by user criteria, which controls what users, groups, roles, companies, locations, or departments can read or not read the content in an article or search.

Role required: user must have contributor access to the knowledge base.

1. Navigate to Knowledge Knowledge Blocks Create New.
2. Click New or open a record.
3. Fill in the fields on the form.
Table 563: Knowledge Block form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>This field is automatically set to a knowledge block number.</td>
</tr>
<tr>
<td>Knowledge base</td>
<td>Name of the knowledge base.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> The knowledge blocks feature must be enabled for each knowledge base that you plan to create blocks. See <em>Enable knowledge blocks for each knowledge base</em> on page 1522.</td>
</tr>
<tr>
<td>Category</td>
<td>Name of the knowledge category or subcategory.</td>
</tr>
<tr>
<td>Can read</td>
<td>User criteria to apply for read access at the knowledge block level.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> User criteria set at the knowledge base and knowledge block level controls which users can read or not read block content within an article. To learn more about selecting user criteria for a knowledge block, see <em>Select user criteria for a knowledge block</em> on page 1525.</td>
</tr>
<tr>
<td>Cannot read</td>
<td>User criteria to apply for cannot read access at the knowledge block level.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> User criteria set at the knowledge base and knowledge block level controls which users can read or not read block content within an article. To learn more about selecting user criteria for a knowledge block, see <em>Select user criteria for a knowledge block</em> on page 1525.</td>
</tr>
<tr>
<td>Valid to</td>
<td>Date that the knowledge block expires. After the valid to date:</td>
</tr>
<tr>
<td></td>
<td>• Knowledge article viewer will no longer display expired knowledge block content in the associated knowledge article.</td>
</tr>
<tr>
<td></td>
<td>• Search will no longer return knowledge articles if the keywords are contained in the expired blocks.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Short Description</td>
<td>Description of the knowledge block.</td>
</tr>
<tr>
<td>Text</td>
<td>Text of the knowledge block.</td>
</tr>
<tr>
<td>Version</td>
<td>This field is automatically set to a version number when the article versioning feature is enabled.</td>
</tr>
</tbody>
</table>

**Note:** Knowledge blocks can be used with or without the article versioning feature. To learn more about article versioning, including how to disable the feature, see [Article versioning](#) on page 1451.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Article type</td>
<td>This field is automatically set to HTML.</td>
</tr>
<tr>
<td>Workflow</td>
<td>This field is automatically set to the publication state of the block, such as Draft, Published, or Retired.</td>
</tr>
<tr>
<td>Source task</td>
<td>Not applicable.</td>
</tr>
</tbody>
</table>

4. Click Save or Update to create or update the block.
5. Click Publish to publish the block.

**Note:** Any additional steps required to publish the knowledge block, such as approvals, depend on the publishing workflow for the knowledge base. See [Knowledge workflows](#) on page 1419 for more information.

After the knowledge block is published, you can add the block to an article within the knowledge base.

### Select user criteria for a knowledge block

User criteria set at the knowledge base and knowledge block level controls which users can read or not read block content within an article in a knowledge base. As a knowledge contributor, you can apply user criteria at the knowledge block level.

**Role required:** user must have contributor access to the knowledge base.

1. Navigate to Knowledge Knowledge Blocks All.
2. Open a knowledge block.
3. Apply the desired user criteria for the Can Read and Cannot Read fields.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can Read</td>
<td>User criteria to apply for read access at the knowledge block level.</td>
</tr>
<tr>
<td>Cannot Read</td>
<td>User criteria to apply for cannot read access at the knowledge block level.</td>
</tr>
</tbody>
</table>

**Note:**

- You can use existing or create user criteria records. To create a new record, see [Create a user criteria record in Knowledge Management](#) on page 1400.
• If a user meets any Can Contribute criteria at the knowledge base level, they can read all knowledge block content, regardless of the Can read and Cannot read criteria set at the knowledge block level.
• If a user meets any Cannot read criteria at the knowledge block level, they cannot read the block content, regardless of the Can read criteria set at the knowledge block level.
Can Contribute access at knowledge base level?

Yes

Can Read access at knowledge base level?

No

Cannot read block

Yes

Can read block

No

Can read access at block level?

Yes

No

Cannot read block
4. Right-click the form header and click Save.

- To finish and publish the block, see *Create a knowledge block* on page 1523.
- To add the block to an article, as well as preview the article by impersonating different users, see *Add knowledge blocks to a knowledge article* on page 1528.

Retire a knowledge block

You can retire a published knowledge block so that it is no longer available for users to view or search. A knowledge block can only be retired if it is not being used in any knowledge articles.

Role required: user must have contributor access to the knowledge base.

1. Navigate to Knowledge Knowledge Blocks Published.
2. Open the applicable record.
3. In the Articles related list, verify that the knowledge block is not being used in any knowledge articles.

   **Note:** A knowledge block can only be retired or deleted if it is not being used in any knowledge article, including any retired article or previous version of an article.

4. Click Retire to retire the knowledge block.

   **Note:** Any additional steps required to retire the knowledge block, such as approvals, depend on the workflow for the knowledge base. See *Knowledge workflows* on page 1419 for more information.

Add knowledge blocks to a knowledge article

As a knowledge contributor, you can insert one or more knowledge blocks into a knowledge article within a knowledge base. Each knowledge block is secured by user criteria, and you can preview the article by impersonating different users to see how the article displays or hides block content based on the read and cannot read access.

Role required: user must have contributor access to the knowledge base.

1. Navigate to Knowledge Articles All.
2. Click New or open a record.
3. Fill in the fields on the form, as appropriate.
   For further details on creating a knowledge article, see *Create a knowledge article* on page 1394.
4. To add blocks to the article:
   a) Click Add Blocks to open the Add Blocks side panel.

   **Note:** If the Add Blocks button is not visible, make sure that the knowledge blocks feature is enabled for the knowledge base that the article is in. See *Enable knowledge blocks for each knowledge base* on page 1522 for more information.
b) In the Add Blocks side panel, you can search for, do an advanced search, view, and insert blocks into the article. You can also create blocks directly from the side panel.

**Note:** If there are knowledge blocks you cannot find, make sure that the blocks are published, in the same language, and in the same knowledge base as the article.
5. Click Save or Update to create or update the article.
6. To preview the article as different users:
   a) In the Related Links section, click Preview Article with Blocks.
b) In the View As field, you can search for and impersonate different users to see how the article appears based on the user's can and cannot read access.

The following GIF shows an example of the author previewing the article as different users in different locations. Ashley Aoto sees the block content for Location A, Beth Berry sees the block content for Location B, and Claire Chaganti sees the block content for Location C.
Company Holiday Calendar

Employees in Location A have the following company holidays.

- Mon, January 1 - New Year's Day
- Mon, February 19 - Presidents' Day
- Mon, May 28 - Memorial Day
- Wed, July 4 - Independence Day
- Mon, September 3 - Labor Day
- Thurs, November 22 - Thanksgiving
- Tues, December 25 - Christmas Day
- Mon, December 31 - New Year's Eve

Employees in Location B have the following company holidays.

- Mon, January 26 - Republic Day
- Tues, May 1 - May Day
- Fri, June 13 - Eid al-Fitr
- Wed, August 15 - Independence Day
- Thurs, September 13 - Ganesh Chaturthi
- Tues, October 2 - Gandhi Jayanthi
- Wed, November 7 - Diwali
- Tues, December 25 - Christmas Day

Employees in Location C have the following company holidays.

- Mon, January 1 - New Year's Day
- Fri, March 30 - Good Friday
- Mon, April 2 - Easter Monday
- Mon, May 7 - Early May Bank Holiday
7. Click Publish to publish the article.

**Note:** Any additional steps required to publish the knowledge article, such as approvals, depend on the publishing workflow for the knowledge base. See *Knowledge workflows* on page 1419 for more information.

Integrating a custom search or knowledge article viewer with knowledge blocks

If you are using a custom search or knowledge article viewer with your application, you can integrate that custom search or viewer with the appropriate knowledge or knowledge blocks API.

**Note:** Integration is only necessary if you are using a custom search or knowledge article viewer.

**KBPortalServiceImpl - Global**

The KBPortalServiceImpl API is included with Knowledge Management V3 [com.snc.knowledge3] as a script include. It provides methods to use with knowledge, such as integration with a custom search.  

*KBPortalServiceImpl - KBPortalServiceImpl()*

Instantiates a KBPortalServiceImpl object in a global application.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*KBPortalServiceImpl - getResultData(Object request)*

Returns search results based on keywords from the knowledge article and from relevant knowledge block content that the user has access to read.

If you have activated the knowledge blocks feature and are using a custom search for knowledge with your application, your search may not return relevant articles when keywords are contained in the blocks. To return search results based on keywords from the article and from relevant block content that the user has access to read, you must call the getResultData() method inside your custom search.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>request</td>
<td>Object</td>
<td>JSON object to refine the search.</td>
</tr>
</tbody>
</table>

**Table 566: Returns**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object</td>
<td>Array of search results in JSON format based on keywords from the knowledge article and from relevant knowledge block content that the user has access to read.</td>
</tr>
</tbody>
</table>
Integrating a custom search with knowledge blocks

```javascript
function doKeywordSearch(queryText, count, queryLocation) {
  var results = [];

  // To set up the request.
  var request = {
    keyword: queryText,
    language: "",

    // To pass data to filter on different metadata.
    variables: {
      kb_knowledge_base: ['Knowledge'],
      kb_category: '',
      author: ['']
    },

    // Provide the following.
    context: gs.getProperty('glide.knowman.sp.search_context', 'Knowledge Search'),
    resource: 'Knowledge',
    order: "relevancy,true",

    // Provide the pagination variables.
    start: queryLocation,
    end: queryLocation+count,

    attachment: false,

    // Provide any additional metadata you want to include in your results.
    knowledge_fields: [
      "number",
      "sys_id",
      "published"
    ]
  };

  // To execute the search.
  var response = new KBPortalServiceImpl();
  response.getResultData(request);

  // To send the search results back to the UI or to store results in your object.
  for (var i = 0; i < response.results.length; i++) {
    result = response.results[i];
    var article = {};
    article.sys_id = result.meta.sys_id.display_value;
    article.number = result.meta.number.display_value;
    article.short_description = article.short_description;
    article.title = result.title;
    article.published = result.meta.published.display_value;
    article.publishedUTC = result.meta.published.display_value;
    article.text = article.text;
    article.score = result.meta.score;
    article.label = article.short_description;
    article.shortDescription = article.short_description;
    results.push(article);
  }

  return results;
}
```
KBBlock - Global

The KBBlock API is included with knowledge blocks [com.snc.knowledge_blocks] as a script include. It provides methods to use with the knowledge blocks feature, such as integration with a custom knowledge article viewer.

KBBlock - KBBlock()

Instantiates a KBBlock object in a global application.

Table 567: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

KBBlock - getArticleContent(GlideRecord knowledgeRecord)

Gets knowledge articles with relevant knowledge block content that a user has access to read.

If you have activated the knowledge blocks feature and are using a custom knowledge article viewer with your application, your viewer may not display articles that expand the relevant block content. To expand block content that a user has access to read, you must call the getArticleContent() method inside your custom viewer.

Table 568: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>knowledgeRecord</td>
<td>GlideRecord</td>
<td>GlideRecord of the knowledge article to display.</td>
</tr>
</tbody>
</table>

Table 569: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>Knowledge article with relevant knowledge block content that a user has access to read.</td>
</tr>
</tbody>
</table>

Integrating a custom knowledge article viewer with knowledge blocks

// This function returns the article text with expanded block content.
function getArticleText(kbSysId) {
  var knowledgeRecord = new GlideRecord('kb_knowledge');
  var kbText='';
  if(knowledgeRecord.get(kbSysId)) {
    if(new GlidePluginManager().isActive('com.snc.knowledge_blocks')) {
      kbText = new KBBlock();
      kbText.getArticleContent(knowledgeRecord);
    } else
      kbText = knowledgeRecord.getValue('text');
  }
  return kbText;
}
Managed Documents

Use the ServiceNow® Managed Documents application to control electronic documents within your instance.

After parameters have been set by the administrator and the Knowledge Document plugin installed, documents can move through the managed document cycle.

Note: Step through the process below on your test (or any non-production) instance.

Managed Document features

Managed Documents is a lightweight, ITIL-based solution for creating and managing electronic documents within your instance.

This application adds a layer of control around any document by providing workflow, storage, security, and categorization options. It can be used for a variety of internal documents, such as policies and procedures, compliance documentation, and knowledge articles. Because it is integrated within the instance, Managed Documents offers a seamless alternative to 3rd-party systems.

Table 570: Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check-in/Check-out</td>
<td>Track revisions, approval history, and automated notifications for approvers and reviewers. Useful for compliance and risk authors, policy and procedure writers, and contract administrators.</td>
</tr>
<tr>
<td>Categorization</td>
<td>Classify documents for organization and search.</td>
</tr>
<tr>
<td>Access control</td>
<td>Share documents with selected users.</td>
</tr>
<tr>
<td>Revision control</td>
<td>Track changes to documents.</td>
</tr>
<tr>
<td>Digital signature for approval</td>
<td>Integration with the Approval with E-Signature plugin.</td>
</tr>
<tr>
<td>Workflow</td>
<td>Support consistent content review and approval.</td>
</tr>
<tr>
<td>Security</td>
<td>Use high security setting.</td>
</tr>
</tbody>
</table>

Managed Document concepts

The following concepts explain Managed Documents: Managed Document, Document Collection, Document Revisions, and Document Parameters.
### Table 571: Concepts

<table>
<thead>
<tr>
<th>Concept</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Managed Document</td>
<td>The Document [dms_document] table contains the documents controlled through the managed documents process.</td>
</tr>
<tr>
<td>Document Collection</td>
<td>The Document Collection [dms_collection] table allows related documents to be grouped together.</td>
</tr>
<tr>
<td>Document Revisions</td>
<td>Because managed documents must have clear records of individual versions of a document, revisions (including the file) are attached to the master document record through a related list. Document revisions are controlled to keep a standard naming scheme and consistent version numbers. Once a document revision is ready, it can be submitted for review.</td>
</tr>
</tbody>
</table>

#### Document Parameters

**Attention:** Parameters do not control application or document security. Parameters only organize documents, they do not affect who can access documents. To grant access to the Managed Documents application, you can assign a role. To grant access to a specific document, set user and group permissions.

Each document can be associated with predefined parameters. The parameters can help with grouping documents.

- **Type:** Defines the type of document being controlled. Documents of the same type use the same controls.
- **Classification:** Defines document restriction level, such as public, restricted, or confidential.
- **Audience:** Defines the groups with access to the document, such as internal or external.
- **Name Formats:** Defines the format of document names, ensuring that documents of the same type have the same name scheme assembled from name components.
- **Name Components:** Defines the document values used in the name formats.
- **Approval Rules:** Defines the approvals the document must have before it can be published.
Install the Managed Documents plugin

The Managed Documents plugin is available for activation by users with the admin role.

1. Navigate to System Definition Plugins.
2. Right-click the plugin name on the list and select Activate/Upgrade.
   If the plugin depends on other plugins, these plugins and their activation status are listed.
3. [Optional] Select the Load demo data check box.
   Some plugins include demo data—sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good policy when first activating the plugin on a development or test instance. You can load demo data after the plugin is activated by repeating this process and selecting the check box.
4. Click Activate.

Managed Documents plugin

This page describes the applications and modules, database table structure, scripts, and roles.

Database table structure

The following tables are added:

<table>
<thead>
<tr>
<th>Display Name (Table Name)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revision [dms_revision]</td>
<td>The document revisions.</td>
</tr>
<tr>
<td>Classifications [classification]</td>
<td>The document restriction level, such as public or confidential. (Does not define access to the document. Document security is set in user and group permissions.)</td>
</tr>
<tr>
<td>Type [dms_type]</td>
<td>The document purpose.</td>
</tr>
<tr>
<td>Component [dms_component]</td>
<td>The components of name formats. The value field is a dot-walking expression that is evaluated. An exception is made for the revision because it does not exist when the revision name is generated.</td>
</tr>
<tr>
<td>Name format [dms_name_format]</td>
<td>The composition of components to generate revision names.</td>
</tr>
<tr>
<td>Approval sequence [approval_sequence]</td>
<td>The approval sequences that users need to follow.</td>
</tr>
<tr>
<td>Approval Rule [dms_approval_rule]</td>
<td>The criteria that records of the dms_document table must match. Used to automatically add approvers to a document.</td>
</tr>
<tr>
<td>Display Name (Table Name)</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td>Collection [dms_collection]</td>
<td>The document groups created by the user.</td>
</tr>
</tbody>
</table>

**Scripts**

**Table 573: Business rules that are added to sys_script**

<table>
<thead>
<tr>
<th>Rule</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Update Document</td>
<td>Changes the state of a document depending on its revisions.</td>
</tr>
<tr>
<td>Add Approvers</td>
<td>Populates the list of approvers in the document.</td>
</tr>
</tbody>
</table>

**Table 574: Script includes that will be added to sys_script_include**

<table>
<thead>
<tr>
<th>Script include</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DocumentManagement</td>
<td>Contains the main logics for the Managed Documents plugin.</td>
</tr>
<tr>
<td>DocumentManagementDB</td>
<td>Contains methods to perform CRUD operations on the database.</td>
</tr>
<tr>
<td>DocumentManagementSecurity</td>
<td>Helps manage the security of the Managed Documents system.</td>
</tr>
<tr>
<td>DocumentManagementAjax</td>
<td>Updates the details of the temporary revision that is created when opening the upload/check in revision form.</td>
</tr>
<tr>
<td>DocumentAttachmentAjax</td>
<td>Renames an attachment file.</td>
</tr>
<tr>
<td>DocumentRevisionWorkflowHelper</td>
<td>Helps perform basic workflow operations on a revision.</td>
</tr>
<tr>
<td>DocumentManagementApprovalMatcher</td>
<td>Helps obtain the user and group approvers for a document that matches approval rules.</td>
</tr>
<tr>
<td>DocumentApproverHelper</td>
<td>Contains logics to handle document approvers.</td>
</tr>
<tr>
<td>DocumentManagementUtils</td>
<td>Useful methods.</td>
</tr>
<tr>
<td>DocumentReferenceQualifiers</td>
<td>Static methods that return reference qualifiers.</td>
</tr>
</tbody>
</table>

**Table 575: Client script that is added to sys_script_client**

<table>
<thead>
<tr>
<th>Rule</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Document type change</td>
<td>Updates the name format field in the revision settings section of the document. Each type has a default name format.</td>
</tr>
</tbody>
</table>
Roles

This plugin introduces two new roles:

Table 576: Roles

<table>
<thead>
<tr>
<th>Role</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>document_management_user</td>
<td>This role enables a user to access the Managed Documents plugin, create documents, and search for documents. Document reviewers and approvers need the document_management_user role to access the Managed Document plugin. (Please note that reviewers and approvers can also access a document revision from an approval record.)</td>
</tr>
<tr>
<td>document_management_admin</td>
<td>This role enables a user to change administrative settings for the Managed Documents plugin.</td>
</tr>
</tbody>
</table>

**Note:** Each document has individual permissions, so even if a user is given the document_management_user role and has permissions to the application, the user can only view documents to which they have been given access.

Create a new managed document record

Configure the properties and policies for a managed document.

1. Navigate to Managed DocumentsCreate New.
2. In the Name field, type Policy.
3. In the Requested by field, add your name.
4. In the Owner field, add your name.
5. In the Reviewer field, add your name.
6. In the Type field, select Policy.
7. In the Classification field, select Confidential.
8. In the Audience field, select Internal.
9. Under Revision Settings, select the Auto increment revision option.
10. Click Submit.

Check in a document after making changes

After making changes to a document, check the revised document into Managed Documents.
1. Open the document record.
2. Click the Upload/Check in Revision related link.
3. Click Choose File, select the revised file, and click Open.
4. Check that the Name and Revision Number contain the updated number.
5. Ensure that the Check in option is selected.
6. Click OK.

The Document Revisions list updates to contain the most recent revision.

Check out a document to make changes

After a document is added to a managed document record, check the file out to make changes. Checking documents in and out keeps a record of document changes and ensures that only one person at a time is editing the document.
1. Open the document record.
2. Select the Check Out Document related link.
4. Click Check Out.
5. Open the file and make a small change.
6. Save the document with the same name, but a new revision number. For example, Policy_POL_02.txt.

Publish a document in Managed Documents

After the document is reviewed and approved, publish the document within Managed Documents.

1. Open the document record.
2. In the Document Revisions list, click the name of the revision that was approved and is listed in the Ready for Publishing stage.
3. In the header bar, click Publish Revision.

4. In the Publish revision dialog box, check that the name and revision number are correct and click Publish.
   In the Document Revisions list, the revision you just published is now in the Published stage.
Send a document out for review and approval

When a document is ready, send it out for review and approval. If a reviewer or approver is not identified in the document record, the document is moved directly to the publishing stage.

1. In the Document Revisions list, right-click the revised document and select Submit Revision.

Because you identified yourself as the reviewer, you receive an approve request email message.

2. In the email message, click the link next to Click here to view Approval Request.
3. (Optional) View the document by clicking the attachment name under Document Revision.
4. Click Approve.
   The Approvals page displays and lists the document you just approved.
5. Open the document record.
6. In the Document Revisions list, the revision you approved is now in the Ready for Publishing stage.

Upload a document as an attachment

After creating a document record, add the document to the record as an attachment.

1. Open the document record.
2. Select the Upload/Check in Revision related link.

3. Click Choose File.
4. Select a simple document, such as a text file, and click Open.
5. Check that the name reads Policy_POL_0.1.
6. Click OK.
   The document is listed under Document Revisions.
Defining Document Parameters

Before using the Managed Documents application, the user with the document_management_admin role needs to set the parameters that define the kinds of documents to be managed through the application. Managed Documents provides both base and custom parameter options.

Defining Document Parameters

The following document parameters should be defined:

- **Type**: identifies the purpose of the document. The type also determines the default document format and name format.
- **Classification**: indicates the security level assigned to the document and determines who can view or edit the document.
- **Audience**: specifies the intended readers of the document.
- **Name format**: specifies the name format to use when a document revision is added.
- **Name components**: are individual identifiers used inside a name format. Name components define a reference path (often by dot-walking) that holds the value specific to the document.
- **Approval rules**: determine which approvers are added to documents (in addition to the Reviewers specified on the document record).

Defining Types

To define a new type, navigate to Managed Documents Administration Type and click New.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>A unique name for the type.</td>
</tr>
<tr>
<td>Code</td>
<td>A short code for the type. Referenced as a name component for the name format.</td>
</tr>
<tr>
<td>Label</td>
<td>A label to display in the Type choice list.</td>
</tr>
<tr>
<td>Name Format</td>
<td>The name format that documents of this type will use.</td>
</tr>
<tr>
<td>Order</td>
<td>A number indicating the type's sequence in the choice list.</td>
</tr>
</tbody>
</table>

The following types are available in the base system.

<table>
<thead>
<tr>
<th>Name</th>
<th>Code</th>
<th>Label</th>
<th>Name format</th>
<th>Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>-- None --</td>
<td>null</td>
<td>-- None --</td>
<td>null</td>
<td>1</td>
</tr>
<tr>
<td>policy</td>
<td>POL</td>
<td>Policy</td>
<td>Default Policy</td>
<td>2</td>
</tr>
<tr>
<td>guideline</td>
<td>GUI</td>
<td>Guideline</td>
<td>Default</td>
<td>3</td>
</tr>
<tr>
<td>procedure</td>
<td>PROC</td>
<td>Procedure</td>
<td>Default</td>
<td>4</td>
</tr>
<tr>
<td>contract</td>
<td>CON</td>
<td>Contract</td>
<td>Default</td>
<td>5</td>
</tr>
</tbody>
</table>
**Note:** For documents with a Type of Contract, a Contracts related list appears on the document record, listing any contracts the document is associated with.

### Defining Approval Rules

To define a new approval rule, navigate to Managed Documents Administration Approval Rules and click New.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>A unique identifier for the approval rule.</td>
</tr>
<tr>
<td>Active</td>
<td>A check box indicating whether this approval rule is used.</td>
</tr>
<tr>
<td>Condition</td>
<td>A condition builder that determines which documents use this approval rule.</td>
</tr>
<tr>
<td>Description</td>
<td>A short description of the approval rule.</td>
</tr>
</tbody>
</table>

Once the approval rule is saved, the Approvers related list defines which approvers are added if the conditions in the Condition field are met.

The following approval rules are available in the base system.

<table>
<thead>
<tr>
<th>Name</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal policy</td>
<td>type=Policy ^ audience=Internal</td>
</tr>
<tr>
<td>Development policy</td>
<td>type=Policy ^ department=Development</td>
</tr>
</tbody>
</table>

### Defining Audiences

To define a new audience, navigate to Managed Documents Administration Audience and click New.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audience Name</td>
<td>A unique name for the audience.</td>
</tr>
<tr>
<td>Audience Code</td>
<td>A short code for the audience. Referenced as a name component for the name format.</td>
</tr>
<tr>
<td>Label</td>
<td>A label to display in the Audience choice list.</td>
</tr>
<tr>
<td>Order</td>
<td>A number indicating this audience's sequence in the choice list.</td>
</tr>
</tbody>
</table>

The following audiences are available in the base system.

<table>
<thead>
<tr>
<th>Audience</th>
<th>Audience code</th>
<th>Label</th>
<th>Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>internal</td>
<td>INT</td>
<td>Internal</td>
<td>1</td>
</tr>
<tr>
<td>external</td>
<td>EXT</td>
<td>External</td>
<td>2</td>
</tr>
</tbody>
</table>
Defining Classifications

Define a new classification on the Classification form.

Navigate to Managed Documents Administration Classification and click New.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>A unique name for the classification.</td>
</tr>
<tr>
<td>Code</td>
<td>A short code for the classification. Referenced as a name component for the name format.</td>
</tr>
<tr>
<td>Label</td>
<td>A label to display in the Classification choice list.</td>
</tr>
<tr>
<td>Order</td>
<td>A number indicating this classification's sequence in the choice list.</td>
</tr>
</tbody>
</table>

The following classifications are available in the base system.

<table>
<thead>
<tr>
<th>Name</th>
<th>Code</th>
<th>Label</th>
<th>Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>public</td>
<td>P</td>
<td>Public</td>
<td>1</td>
</tr>
<tr>
<td>restricted</td>
<td>R</td>
<td>Restricted</td>
<td>2</td>
</tr>
<tr>
<td>confidential</td>
<td>C</td>
<td>Confidential</td>
<td>3</td>
</tr>
</tbody>
</table>

Defining Name Components

Name components define the document values used in the name format.

For example, the name component `document.audience.code` dot-walks from the document record to the audience Code.

To define a new name component, navigate to Managed Documents Administration Components and click New.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>A unique identifier for the name component.</td>
</tr>
<tr>
<td>Short Description</td>
<td>A short description of the name component value.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
</tr>
<tr>
<td>Value</td>
<td>The path to the field holding the value used for the name format. Defined relative to a current revision record. For example: • Enter revision to use the revision Number field on the revision record. • Enter document.name to use the Name field on the revision’s referenced document. • Enter document.audience.code to use the Code field for the audience referenced by the document. This dot-walking approach makes it possible to get any value related to the revision into the name format.</td>
</tr>
</tbody>
</table>

**Note:** The revision component is a special component replaced by the appropriate revision number (rather than querying a value related to the current record). The revision is either automatically incremented or uses the latest revision number, depending on the setting on the document form.

The following components are defined in the base system.

<table>
<thead>
<tr>
<th>Name</th>
<th>Short description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audience code</td>
<td>Displays the code assigned to the document audience.</td>
<td>document.audience.code</td>
</tr>
<tr>
<td>Classification code</td>
<td>Displays the classification code.</td>
<td>document.classification.code</td>
</tr>
<tr>
<td>Document name</td>
<td>Displays the document name.</td>
<td>document.name</td>
</tr>
<tr>
<td>Revision</td>
<td>Displays the document revision.</td>
<td>revision</td>
</tr>
<tr>
<td>Type code</td>
<td>Displays the code assigned to the document type.</td>
<td>document.type.code</td>
</tr>
</tbody>
</table>

**Defining Name Formats**

The name format automatically generates a name for a document revision by arranging name components in a standard code to match naming conventions.

For example, a name format with the name components Type Code, Document Name, and Revision Number and the separator -, would be formatted as:

```
TYPECODE-Name-RevNumber.fileformat
```

In this example, a policy (code POL) named IT Off-Boarding Policy, with revision number 1.0, and uploaded as a .docx file would have the name:

```
POL-IT Off-Boarding Policy-1.0.docx
```

To define a new name format, navigate to Managed Documents Administration Name Formats and click New.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>A unique name for the name format.</td>
</tr>
<tr>
<td>Separator</td>
<td>A separator to put between each of the components. Hyphens (-) and underscores (_ ) are commonly used. Using alphanumeric characters can create a confusing name format.</td>
</tr>
<tr>
<td>Description</td>
<td>A description of the name format.</td>
</tr>
</tbody>
</table>

Use the related list to add name components. Use the Order field to set the sequence in which name components are used.

The following name formats are defined in the base system.

<table>
<thead>
<tr>
<th>Name</th>
<th>Separator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default</td>
<td>_</td>
<td>The default format. Document name and revision separated by an underscore.</td>
</tr>
<tr>
<td>Default Policy</td>
<td>_</td>
<td>The format for the policy document type.</td>
</tr>
<tr>
<td>Development documentation</td>
<td>(no separator)</td>
<td>The format for the software documentation type.</td>
</tr>
<tr>
<td>Development Sources</td>
<td>(no separator)</td>
<td>The format for the development and code sources type.</td>
</tr>
<tr>
<td>Intranet Improvement</td>
<td>(no separator)</td>
<td>The format for documents that describe intranet use.</td>
</tr>
</tbody>
</table>

**Defining Document Workflow**

In the base system, all managed documents use the Managed Documents workflow after the Active check box is selected.
Figure 299: Document workflow
The document parameters defined in the workflow are often used as conditions to trigger more specific workflows, such as type-specific workflows or classification-specific workflows. If different kinds of documents should follow different workflows, use the Graphical Workflow Editor to create new workflows.

**Knowledge document**

The Knowledge Document plugin extends the Managed Documents plugin by providing the functionality for managed documents to be published to the knowledge base.

**Installed with knowledge document**

These elements are installed with the knowledge document plugin.

**Dependencies**

The Knowledge Document plugin depends on the Managed Documents plugin. Activating Knowledge Document activates Managed Documents.

**Tables**

Table 577: Tables

<table>
<thead>
<tr>
<th>Display Name [table_name]</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Records [m2m_document_knowledge]</td>
<td>A many-to-many table storing the relationship between a document and a knowledge article.</td>
</tr>
</tbody>
</table>

**UI Actions**

Table 578: UI actions

<table>
<thead>
<tr>
<th>UI action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Link to Knowledge</td>
<td>Creates or updates a knowledge article related to the current document, depending on whether a knowledge article already exists.</td>
</tr>
</tbody>
</table>

**Scripts**

Table 579: Script includes

<table>
<thead>
<tr>
<th>Script include</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>KnowledgeDocument</td>
<td>Holds the main logic for the Knowledge Document plugin.</td>
</tr>
</tbody>
</table>
Knowledge settings fields

These fields appear on the Managed Document form Knowledge Settings section.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavior</td>
<td>Defines the process performed when the Link to Knowledge related link is clicked. Select Always create record to create a new knowledge article with the latest published revision attached. The knowledge article is then linked to the document. Select Update existing record to update the existing knowledge article to the latest published revision. If no knowledge articles exist for the document, a new knowledge article is created. The Update existing record option is not available when many knowledge articles are linked to a document.</td>
</tr>
<tr>
<td>Type</td>
<td>Specifies the type of knowledge article. Use Knowledge or any option that extends the kb_knowledge table. For example, if you have the IT GRC plugin installed to create GRC policies, select the type Policies. Note that when a knowledge article is created, the Type field becomes read-only.</td>
</tr>
<tr>
<td>Topic</td>
<td>Defines the subject of the document. Adds the topic information to the same field in the knowledge article.</td>
</tr>
<tr>
<td>Published</td>
<td>Date that the article should be published. Adds publishing date information to the same field in the knowledge article.</td>
</tr>
<tr>
<td>Valid to</td>
<td>Date that the article expires. Adds valid to date information to the same field in the knowledge article.</td>
</tr>
<tr>
<td>Short description</td>
<td>A few words or short phrase describing the knowledge article. Adds the short description to the same field in the knowledge article.</td>
</tr>
</tbody>
</table>

View knowledge linked to a document

You can view the knowledge linked to a document from the document record.

1. Navigate to the document record.
2. Select the Knowledge Records related list.
3. Select the knowledge article to view.

Create a document

After Managed Documents parameters have been set by the administrator, documents can be created, requested, checked out, edited, checked in, copied, and, if necessary, rolled back to an earlier version. Once documents have been added to the Managed Documents application, they can be grouped into document collections.

Approval process

During the approval process, the approver approves or rejects the document. A document goes through the approval process after the review process.

Approval workflow

After the document has been reviewed, submit the document for approval. If the document does not have an approver, the approval process is omitted.

When the document is Active, the workflow Document Management Default is used to manage approvals:
Figure 300: Document Management Default workflow
If the approver rejects the document, the author and owner are notified and the document review is cancelled. The author, owner, and approver should discuss what changes need to be made to the document. When the document is ready, a new review can be initiated.

If the final approver approves the document, the author and the owner are notified. Once final approval is successful, the document stage changes to Ready for Publishing in the Document Revisions list:

![Figure 301: Document Management Default workflow result](image)

Related Links
- [Show Workflow]

Process modification for multiple approvers

If there are multiple approvers, the approval process works in sequence and multiple approvers can be assigned to a single sequence. For example:

Sequence 1: approvers A and B
Sequence 2: approvers C and D
Sequence 3: approver E

Because the sequences take place in ascending chronological order, approvers A and B receive the approval request first (approvers C, D, and E are not part of the process yet). Similar to the review process, the first approver to act within a sequence dictates what happens to the document. If approver A acts first and rejects the document, the approval process stops and the state is set to Cancelled. Approver B's status is changed to No Longer Required. If approver A acts first and approves the document, the process stops and approver B's status is changed to No Longer Required. Then, the document moves to approval
sequence 2. After at least one approver in each sequence approves the document, the author and the owner are notified that the document has been approved.

Review process

During the review process, the reviewer approves or rejects the document. Sometimes a document will have multiple reviewers.

If the reviewer rejects the document, the author and owner are notified and the review is cancelled. The author, owner, and reviewer should discuss what changes need to be made to the document. If the reviewer approves the document, the author and owner are notified that the review was successful and the document can move to the approval stage.

If multiple reviewers are assigned to a document, the first reviewer to act dictates what happens to the document. For example, there are two reviewers, A and B. If reviewer A acts first and rejects the document, the review process stops and the revision state is set to Cancelled. Reviewer B receives a notification email stating that the review was rejected and their status is changed to No Longer Required. If reviewer A acts first and approves the document, the review process stops and the document can move to the approval stage. Reviewer B's status is changed to No Longer Required.

Enable electronic signature for approval

This topic explains how to enabling electronic signatures for approval. Electronic signatures are helpful if you must obtain a digital signature for compliance or auditing purposes.

You can activate the Approval with E-Signature plugin to require that users type in a user name and password when reviewing and approving documents.

The digital signature is not tracked or stored in the document record. Users must simply type in a user name and password after clicking the Approve or Reject button.

Figure 302: Digital signature

After activating the Approval with E-Signature plugin, ensure that a row in the e-signature registry table is created for the dms_document_revision table.

1. Navigate to System Definition e-Signature Registry.
2. Check if dms_document_revision is already listed and Enabled is set to true.
3. If not listed, click New.
4. In Table name, select Document Revision.
5. Select Enabled.
6. Click Submit.

Publish an approved revision

This topic explains how to publish a document revision that has been approved.

Once a document has been created and edited, a specific revision can be submitted for draft review and final approval. After final approval, the document can be published.

Publish the approved revision from the Document Revisions list.

**Note:** Publishing documents to the Knowledge Base requires the Knowledge Document Plugin.

1. Navigate to the document record.
2. In the Document Revisions List, click the revision marked Ready for Publishing.
3. Click Publish Revision to display the Publish dialog box.

The revision number matches the latest revision number. If your standard is to change the revision number when the document is published, such as incrementing the version number to 1.1 or 1.0.1, the change can be made on this dialog box manually.

4. Click Publish.

The published revision is highlighted in green and the stage of previous revisions is automatically changed to Retired:
Note: If the approval and publishing process is repeated, the published revision is retired when the new revision is published. Any workflows running against previous revisions are canceled when the document is published.

Submit a revision for draft review

This topic explains how to submit a document draft for review.

Once a document has been created and edited, a specific revision can be submitted for draft review and final approval. After final approval, the document can be published.

When a draft of the document is ready, submit the draft for review. If the document does not have reviewers identified in the Reviewers field of the document record, the review process is omitted.

1. Navigate to the document record.
2. Right-click the appropriate revision.
3. Select Submit Revision.
   
   The revision stage is set to Awaiting Review.
Create or request a new document

Once an administrator has set parameters for the Managed Documents application, you can create or request new documents.

1. Navigate to Managed Documents Create New.
2. Complete the following fields:

<table>
<thead>
<tr>
<th>Table 581: New document fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field</td>
</tr>
<tr>
<td>Number</td>
</tr>
<tr>
<td>Field</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>Name</td>
</tr>
<tr>
<td>Requested by</td>
</tr>
<tr>
<td>Owner</td>
</tr>
<tr>
<td>Reviewers</td>
</tr>
<tr>
<td>Department</td>
</tr>
<tr>
<td>Type</td>
</tr>
<tr>
<td>Classification</td>
</tr>
<tr>
<td>Audience</td>
</tr>
<tr>
<td>State</td>
</tr>
<tr>
<td>Checked out by</td>
</tr>
<tr>
<td>Description</td>
</tr>
<tr>
<td>Revision Settings</td>
</tr>
<tr>
<td>Name format</td>
</tr>
<tr>
<td>Revision format</td>
</tr>
<tr>
<td>Auto increment revision</td>
</tr>
</tbody>
</table>

The User Permissions related list determines which users have rights to view and contribute to the document:
### Table 582: User permissions

<table>
<thead>
<tr>
<th>Field</th>
<th>Input value</th>
</tr>
</thead>
<tbody>
<tr>
<td>User</td>
<td>A reference to a user who is entitled to read and contribute to the document.</td>
</tr>
<tr>
<td>Type</td>
<td>A choice list describing how the user can interact with the document. Options are:</td>
</tr>
<tr>
<td></td>
<td>• Reader - The user can read the document versions.</td>
</tr>
<tr>
<td></td>
<td>• Editor - The user can upload new versions.</td>
</tr>
<tr>
<td></td>
<td>• Owner - The user can edit the document.</td>
</tr>
</tbody>
</table>

The Group Permissions related list determines which groups have rights to view and contribute to the document:

### Table 583: Group permissions

<table>
<thead>
<tr>
<th>Field</th>
<th>Input value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>A reference to a group of users who are entitled to read and contribute to the document.</td>
</tr>
<tr>
<td>Type</td>
<td>A choice list describing how group members can interact with the document. Options are:</td>
</tr>
<tr>
<td></td>
<td>• Reader - Group members can read the document versions.</td>
</tr>
<tr>
<td></td>
<td>• Editor - Group members can upload new versions.</td>
</tr>
<tr>
<td></td>
<td>• Owner - Group members can edit the document.</td>
</tr>
</tbody>
</table>

### Specify an approver

You can specify approvers for a document record after you save it.

You can have one approver or multiple approvers. For example, set multiple approvers to have one person do a quality check of the document and a different individual to serve as a final approver. Approvers are assigned a number. The lowest number (usually number one) approver always goes first, then any other approvers in ascending chronological order. Multiple approvers can have the same sequence number. For example, two approvers can do a quality check and be assigned sequence number 1. Then, two individuals can be final approvers and be assigned sequence number 2.

1. Navigate to the document record.
2. Right-click in the document header bar and select Add Approver.
3. Add a user name.
4. Select a sequence number from the drop-down list. (Lower numbers approve before higher numbers. For example, approver number one approves before number two.)
5. Click Add User.
6. Repeat steps 2-5 to add more approvers.

Check in a document

Check in the document after you revise it so other users can check out the document.
1. Navigate to the document record.
2. Select the Upload/Check In Revision related link.
3. Click Browse and navigate to the revised file.
4. Click Open.
5. Check the Name and Revision Number.
6. Click OK.

The Document Revisions related list updates to contain the most recent revision:

![Document Revisions](image)

Figure 304: Document revisions

Copy a document

A document can be duplicated at any time. This is useful if you have an existing document that you want to use as a base for a new document.
1. Navigate to the document record.
2. Right-click the header bar and select Copy Document.
   An information message with a link to the new document displays:
3. Click OK.
   The new document is renamed and includes the word “Copy.”

Note: Only the latest revision is copied.

Deactivate a document

To change the document state to Inactive, deactivate the document. This is useful when changes to a document have been put on hold. An inactive document can be reopened at any time.
1. Navigate to the document record.
2. Right-click the header bar and select Deactivate Document.

**Note:** To activate a document, right-click on the header and click Reopen Document.

Reopen a deactivated document

A document that has been deactivated can be reopened.

1. Navigate to the document record.
2. Right-click the header bar and select Reopen Document.

Roll back a document

A document can be rolled back to an earlier revision at any time. Before rolling back to an earlier revision, ensure that the document is not checked out and that you have Editor or Owner permissions for the document.

1. Navigate to the document record.
2. In the Document Revisions list, click the revision to which you want to roll back.
3. Right-click the header bar and select Rollback. The Rollback to Revision dialog box displays. The name and revision number are new. The note specifies the revision to which you are rolling back.

4. Change any information on the Rollback to Revision dialog box as necessary.
5. Click OK. The latest revision is now the revision you selected for rollback.

Cancel a document

Change the document state to Cancelled when no more changes will be made to the document.

When canceling a document, there is no confirmation message, so ensure that you want to cancel the document.

1. Navigate to the document record.

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2. Right-click the header bar and select Cancel Document. An info message confirms the cancellation:
   The State is set to Cancelled:

   ![Figure 305: MDOC cancel 3]

Check out a document

Documents in the Managed Documents application can only be revised by one user at a time. Check out the document to revise it.

1. Navigate to the document record.
2. Select the Check Out Document related link.
3. Select Download file to download the current version of the document when it is checked out.

4. Click Check Out.
   After checking out a document, you can edit the document and make any necessary changes.

Create a document collection

A document collection is a set of individual documents. After documents have been uploaded into Managed Documents, organize the documents by grouping them into collections.

1. Navigate to Managed Documents Document My Collections.
2. Select New.
3. Type in a Name.
4. (Optional) Type in a Description.
5. Click Submit.
6. Click the name of the collection you created.
7. Click Edit.
8. On the left, double-click an available document or select a document and click Add.
9. Click Save. The Document Collection page displays and the individual documents in the collection are listed:

![Image of Document Collection]

**Figure 306: Document collection**

**Upload a document**

Upload a document into a saved record. You can upload text files, spreadsheets, presentations, PDF files, and more.

1. Navigate to the document record.
2. Click the Upload/Check In Revision related link.
3. Click Choose File and navigate to the file.
4. Click Open.
5. Check the Name and Revision Number.
6. Click OK.
Domain separation and Managed Documents

This is an overview of domain separation in Managed Documents. Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.

Overview

Support: Data only

Domain separation in this application is supported at the Data only level, meaning it supports the data security model of separating visibility of data from one domain to another. To learn more, see Application support for domain separation.

MetricBase application

Use the MetricBase application to collect, retain, analyze, and visualize time series data on the Now Platform.

Time series data is a collection of values for an item taken at specific time intervals. Time series data is stored in a separate database, called the MetricBase database. An example is collecting CPU usage values for a computer every hour. You can then use the time series data to evaluate system capacity issues.

The MetricBase application is integrated with the Now Platform making it easy to handle time series data for applications on the Now Platform. The MetricBase database saves values as floating-point numbers.

You can create a trigger that is used with Flow Designer to define when a flow is to be run. A MetricBase trigger can be created with the MetricBase application, or from the Flow Designer.

MetricBase data can be accessed through the Performance Analytics and Reporting application. See the Create time series reports from MetricBase data topic to create advanced reports.

A demonstration plugin is available that contains a user created table with metric fields, triggers, a scheduled job to create data, and the Data Explorer that provides a place to experiment with transform APIs. See MetricBase demonstration application on page 1577 for more information.

The MetricBase product is available as a separate subscription. For more information, see Request the MetricBase product on page 1565.

Request the MetricBase product

The MetricBase product requires a separate subscription and must be activated by ServiceNow personnel. A demonstration plugin with sample tables, metrics, triggers, and data is available. Be sure to request the MetricBase Demo plugin with the MetricBase product.

Role required: none

To purchase a subscription, contact your ServiceNow account manager. The account manager can arrange to have the plugin activated on your organization's production and sub-production instances, generally within a few days.
View time series retention policies

The MetricBase application provides pre-defined retention policies that define the data collection interval for a metric.

Role required: clotho_admin

How often time series data is collected and how long the time series data is retained are important parameters for each metric. The MetricBase application provides pre-defined retention policies. You cannot create retention policies.

A retention policy is a series of time periods and collection rates. An example is 8d@1h, which means for eight days data is collected at one hour intervals. A retention policy is a series of these time periods with longer intervals for each subsequent time period. For example, 8d@1m,94d@10m,397d@1h.

Retention policies define the collection interval, which changes with the age of the data. Older data is compacted and stored with lower fidelity. You can see the available retention policies with the Retention Policies module. The 8d@1m,31d@30m,397d@1h retention policy means

- For the last eight days, data points are available at 1-minute intervals.
- Data points from 9 through 31 days are compressed to 30-minute intervals.
- Data points older than 32 days are compressed to 1-hour intervals.
- If data is ingested at 30-second intervals in the last eight days, one data point is lost. Data in the last eight days are always stored at 1-minute intervals.
- If data is ingested at 2-minute intervals in the last eight days, the missing data points are stored as NaN. Data in the last eight days are always stored at 1-minute intervals.

1. Navigate to MetricBase Retention Policies.
2. Click a policy to view the collection interval specification.

Create a time series metric

Create a time series metric record for each item for which time series data is to be collected. You must define the table, metric field name, and the retention policy.

Role required: clotho_admin

2. Click New.
3. Complete the time series metric definition form then click Submit.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Label</td>
<td>Name of the metric.</td>
</tr>
<tr>
<td>Table name</td>
<td>Required. Name of the table to contain the metric. A table can have multiple metric columns.</td>
</tr>
<tr>
<td>Metric field name</td>
<td>Required. Define the name of the column to be added to the target table.</td>
</tr>
<tr>
<td>Retention policy</td>
<td>Required. Retention policy to use. Select one of the available retention policies.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Application</td>
<td>Application for which this metric is defined.</td>
</tr>
<tr>
<td>Display value aggregator</td>
<td>Aggregation to use for the metric field display value on the list view of the table.</td>
</tr>
<tr>
<td>Display value aggregate duration</td>
<td>Sample interval to use for the metric field display value on the list view of the table.</td>
</tr>
</tbody>
</table>

Adds a float field with the name specified in the Metric field name field to the target table.

**MetricBase triggers**

Use MetricBase triggers with the Flow Designer to determine when flows should run.

The MetricBase application supports three kinds of triggers.

- **Band trigger** — Used to detect when a metric value meets a certain threshold or is within a range.
- **Linear Predictor trigger** — Used to detect when a series of metric values follows an upward or downward trend, and is expected to reach a specified threshold.
- **Gap trigger** — Used to detect when no data is received for a metric.

For each trigger, you define levels that are available when the trigger runs. The levels can be considered severity levels that indicate which threshold has been crossed or range has been entered (band trigger), how long before a threshold value is expected to be reached (linear predictor trigger), or how long it has been since a data value has been received (gap trigger).

**Legacy triggers**

Legacy triggers are used to create a band trigger that evaluates data and executes a script when the trigger criteria are met. See *Create a legacy MetricBase trigger* on page 1572 for the steps to create a legacy trigger.

**Note:** Legacy triggers are not available in new instances.

**Create a MetricBase band trigger**

Create a MetricBase band trigger to use with Flow Designer to detect when a metric value meets a certain threshold or is within a range.

Role required: admin

Define a band trigger to detect when a metric value meets a certain threshold or is within a specified range. You define threshold values and ranges. The level defines which threshold or range has been met.

1. Navigate to MetricBase MetricBase Triggers Trigger Definitions, and click New. The MetricBase Trigger Creation form is shown.
2. Click Band Trigger - Detects and takes action when metric value meet certain threshold or is within a range.
3. Fill in the fields as needed.
Table 585: MetricBase Band trigger form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name for the trigger.</td>
</tr>
<tr>
<td>Aggregator</td>
<td>Specify the aggregation to be done, or none.</td>
</tr>
<tr>
<td>Table name</td>
<td>Specify the table that contains the metric. Only tables that have a metric field are shown in the list.</td>
</tr>
<tr>
<td>Metric</td>
<td>Specify the metric. When you select a metric, the Table name field is updated for the selected metric.</td>
</tr>
<tr>
<td>Active</td>
<td>Specify if the trigger is to be used. Default is checked.</td>
</tr>
<tr>
<td>Description</td>
<td>Describe the trigger.</td>
</tr>
</tbody>
</table>

4. Click Save.
The MetricBase Band Trigger Levels area is added to the form.

5. Do one of the following to add a threshold or a range.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Click New.</td>
<td>The MetricBase Band Trigger Level form is shown.</td>
</tr>
</tbody>
</table>

Edit the cells in the table row.

Table 586: MetricBase trigger form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trigger</td>
<td>This field is pre-filled with the trigger on which you were working. Use the lookup list to select a different trigger.</td>
</tr>
<tr>
<td>Level</td>
<td>Level number. Set to the next available number. You can change the number.</td>
</tr>
<tr>
<td>Function</td>
<td>Function to be used on the value.</td>
</tr>
<tr>
<td>Band Function</td>
<td>To define a range, select the function to be applied to the second value.</td>
</tr>
<tr>
<td>Value</td>
<td>Value to cause a trigger. If no band function is selected, the trigger is a fixed number.</td>
</tr>
<tr>
<td>Band Value</td>
<td>Second value to use to define a range. When a band function is selected, this value is required. This field appears when Greater than, Less than, Greater than or is, or Less than or is is selected from the Band Function field.</td>
</tr>
</tbody>
</table>

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6. Click Update.

Create a MetricBase linear predictor trigger

Create a MetricBase linear predictor trigger to use with Flow Designer to detect when a metric value is expected to cross a specified threshold within a specified time with a specified confidence level.

Role required: admin

Define a linear predictor trigger to do a linear prediction on metrics that are expected to have an upward or downward trend. You define a time window, confidence interval, expected slope, threshold, and severity level. The severity level defines how soon the metric data is expected to reach the threshold value.

The linear predictor trigger uses the most recent data within the defined window to generate a linear formula \( y = a \cdot X + b \). The confidence interval is used to determine when the results are significant enough to be used.

When the confidence interval is met, the linear predictor trigger predicts how soon the data is expected to reach the threshold. The generated regression model slope is checked to see if it is the same as the user-defined slope. A trigger transition is generated when a severity level is met.

If the most recent data point exceeds the threshold, a trigger transition is generated regardless of the calculations.

The confidence level and the trigger levels are two different things. The confidence level is the result of the prediction algorithm, and the trigger levels are what you define for the trigger criteria.

1. Navigate to MetricBase MetricBase Triggers Trigger Definitions, and click New. The MetricBase Trigger Creation form is shown.
2. Click Linear Predictor Trigger - Predicts and takes action when a metric follows an upward or downward trend and is expected to reach a given threshold in the future.
3. Fill in the fields as needed.

Table 587: MetricBase Linear Predictor Trigger form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name for the trigger.</td>
</tr>
<tr>
<td>Window</td>
<td>Length of time to be evaluated.</td>
</tr>
<tr>
<td>Table name</td>
<td>Name of the table containing the metric.</td>
</tr>
<tr>
<td>Confidence Level (%)</td>
<td>Confidence level required for the trigger.</td>
</tr>
<tr>
<td>Metric</td>
<td>Metric to use.</td>
</tr>
<tr>
<td>Trend</td>
<td>Whether the values are increasing or decreasing.</td>
</tr>
</tbody>
</table>
4. Click Save.
The MetricBase Linear Predictor Trigger Levels area is added to the form.

5. Do one of the following to add a level.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Click New.</td>
<td>The MetricBase Band Trigger Level form is shown.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>Specify if the trigger is to be used. Default is checked.</td>
</tr>
<tr>
<td>Threshold</td>
<td>Value the trigger predicts the metric will cross.</td>
</tr>
<tr>
<td>Description</td>
<td>Describe the trigger.</td>
</tr>
</tbody>
</table>

6. Click Update.

Create a MetricBase gap trigger

Create a MetricBase gap trigger to use with Flow Designer to detect when new metric values have not been stored for a metric for a specified period.

Role required: admin

Define a gap trigger to determine when no data is received for a metric within a time window. You can define severity levels for different gap periods. There must be at least 10 minutes between gap periods, for example, 30 minutes for level 1 and 40 minutes for level 2.

The frequency the system checks for gap triggers is determined by the minimum difference between two levels, divided by 2. If a gap trigger defines level 1 as 30 minutes and level 2 as 50 minutes, the difference between the two is 20 minutes. Dividing 20 minutes by 2 gives the frequency of 10 minutes. If more than two levels are defined, the smallest gap between levels is used in the calculation.

The frequency the system checks for a gap trigger is at least every 30 minutes, but no more often than every 5 minutes.
The gap trigger may happen after the gap period. For example, when the frequency of checking for gaps in data is 10 minutes, and a gap period is 30 minutes, the trigger may occur as late as 40 minutes after the last data value was received.

1. Navigate to MetricBase MetricBase Triggers Trigger Definitions, and click New. The MetricBase Trigger Creation form is shown.
2. Click Gap Trigger - Detects and takes action when no data is received for a metric.
3. Fill in the fields as needed.

### Table 589: MetricBase gap trigger form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name for the trigger.</td>
</tr>
<tr>
<td>Table name</td>
<td>Specify the table that contains the metric. Only tables that have a metric field are shown in the list.</td>
</tr>
<tr>
<td>Metric</td>
<td>Specify the metric. When you select a metric, the Table name field is updated for the selected metric.</td>
</tr>
<tr>
<td>Active</td>
<td>Specify if the trigger is to be used. Default is checked.</td>
</tr>
<tr>
<td>Description</td>
<td>Describe the trigger.</td>
</tr>
</tbody>
</table>

4. Click Save. The MetricBase Gap Trigger Levels area is added to the form.

5. Do one of the following to add a threshold or a range.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>Click New.</td>
<td>The MetricBase Band Trigger Level form is shown.</td>
</tr>
</tbody>
</table>

**Edit the cells in the table row.**

### Table 590: MetricBase Gap Trigger Level form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trigger</td>
<td>This field is pre-filled with the trigger on which you were working. Use the lookup list to select a different trigger.</td>
</tr>
<tr>
<td>Level</td>
<td>Level number. Set to the next available number. You can change the number.</td>
</tr>
<tr>
<td>Function</td>
<td>Function to use on the value.</td>
</tr>
<tr>
<td>Window</td>
<td>Length of time that no data has been received.</td>
</tr>
</tbody>
</table>

6. Click Update.
Create a legacy MetricBase trigger

Create a trigger to run a script. The trigger is based on static thresholds you create. Data is checked when added to the MetricBase database.

Role required: admin

**Note:** The legacy MetricBase trigger is deprecated and is unavailable for new instances, but is still available on instances upgraded from a previous release.

To create a trigger, select the metric, create a filter to select the records to be evaluated against the trigger criteria, define the trigger criteria, and write the script to run when the trigger criteria are met.

**Note:** The script is not used to determine when the trigger is triggered.

After the trigger has been created, you can specify the trigger levels. Trigger levels define a value or range of values and are part of the trigger criteria. The trigger level whose criteria has been met is one of the parameters to the trigger script. You can define one or more trigger levels for a trigger.

You can use the condition builder to use any field in the table containing the metric to specify the records to be used by the trigger criteria.

A trigger script should have a short execution time. Do not write a script that performs significant amounts of processing. Instead, update a field or create an event and then exit.

1. Navigate to MetricBase Trigger Definitions, and click New.
   The MetricBase Trigger New Record form is shown.
2. Fill in the fields as needed.

### Table 591: MetricBase trigger form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name for the trigger.</td>
</tr>
<tr>
<td>Aggregator</td>
<td>Specify the aggregation to be done, or none.</td>
</tr>
<tr>
<td>Window</td>
<td>Specify the time period to be used for the aggregation.</td>
</tr>
<tr>
<td></td>
<td>This field appears when Min, Max, or Average is selected from the Aggregator field.</td>
</tr>
<tr>
<td>Table name</td>
<td>Specify the table that contains the metric. Only tables that have a metric field are shown in the list.</td>
</tr>
<tr>
<td>Metric</td>
<td>Specify the metric.</td>
</tr>
<tr>
<td></td>
<td>When you select a metric, the Table name field is updated for the selected metric.</td>
</tr>
<tr>
<td>Active</td>
<td>Specify if the trigger is to be used.</td>
</tr>
<tr>
<td>Filter</td>
<td>Specify the criteria for selecting records from the table.</td>
</tr>
<tr>
<td>Description</td>
<td>Describe the trigger.</td>
</tr>
</tbody>
</table>
3. Click Submit.

Create a legacy MetricBase trigger level

Define levels or ranges for a trigger.

Role required: admin

The trigger must be defined before you can create a trigger level. Trigger bands must not overlap.

**Note:** The legacy MetricBase trigger level is deprecated and is unavailable for new instances, but is still available on instances upgraded from a previous release.

1. Navigate to MetricBase Trigger Definitions, and click the trigger for which you want to add a trigger level.
   The MetricBase Trigger form is shown.
2. Scroll down to the MetricBase Trigger Levels list, and click New.
   The MetricBase Trigger Level New record form is shown.
3. Fill in the fields as needed.

**Table 592: MetricBase trigger form**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trigger</td>
<td>This field is pre-filled with the trigger on which you were working. Use the lookup list to select a different trigger.</td>
</tr>
<tr>
<td>Level</td>
<td>Level number. Set to the next available number. You can change the number.</td>
</tr>
<tr>
<td>Function</td>
<td>Function to use on the value.</td>
</tr>
<tr>
<td>Band Function</td>
<td>To define a range, select the function to be applied to the second value.</td>
</tr>
<tr>
<td>Value</td>
<td>Value to cause a trigger. If no band function is selected, the trigger is a fixed number.</td>
</tr>
<tr>
<td>Band Value</td>
<td>Second value to use to define a range. When a band function is selected, this value is required. This field appears when Greater than, Less than, Greater than or is, or Less than or is is selected from the Band Function field.</td>
</tr>
</tbody>
</table>
Create an Action Condition

An Action Condition is a script that is run when trigger conditions are met, but before the Flow actions begin. If the Action Condition script returns true, the Flow actions are executed. If the Action Condition script returns false, the Flow actions are not executed.

Role required: admin

Use the Action Condition to check for duplicate triggers. You can determine if the record that the flow action is going to update has already been updated, and return false to prevent the flow action from being executed.

In the Flow Designer, use the Additional Filtering field to assign the Action Condition to a flow.

1. Navigate to MetricBase MetricBase Triggers Trigger Moderators, and click New.
   The Additional MetricBase Trigger Filtering and Moderation form is shown.

2. Fill in the fields as needed.

   Table 593: Additional MetricBase Trigger Filtering and Moderation form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name for the Action Condition.</td>
</tr>
<tr>
<td>Application</td>
<td>Application for which the Action Condition is defined.</td>
</tr>
<tr>
<td>Description</td>
<td>Describe the Action Condition.</td>
</tr>
<tr>
<td>Script</td>
<td>Specify the script. The trigger definition record, the record containing the metric that created the trigger, the date and time the trigger occurred, and the band level for the trigger are input parameters to the script. If the script returns true, the Flow action is executed.</td>
</tr>
</tbody>
</table>

3. Click Submit.

Store time series data

Use JavaScript, REST, or scriptable REST APIs to add time series data to a metric field.
It is recommended that you use the REST APIs to store time series data.

For information on the MetricBase REST APIs see the REST API Explorer on an instance with the MetricBase application installed, or see the Clotho Time Series API.

For information on the MetricBase JavaScript APIs, see Client, Data, DataBuilder, Transformer, TransformPart, TransformResult.

In practice, for performance reasons, batch multiple series of multiple data points and store them at one time, do not insert each data point individually.

**Store time series data using REST APIs**

```bash
```

**Store time series data using JavaScript APIs**

```javascript
// get the subject GlideRecord with which we are going to put metric data
var gr = new GlideRecord('cmdb_ci_computer');
gr.get(<sys id of record containing metric to be stored>);

// build time series data for cpu_percentage metric. time is GlideDateTime
var dataBuilder = new sn_clotho.DataBuilder(gr, 
    'cpu_percentage').add(time, 0.75);

// use clotho client to insert data
new sn_clotho.Client().put(dataBuilder);
```

**Analyze time series data**

Use JavaScript or REST APIs to extract time series data from the MetricBase database, and to run transforms on the data.

For information on the MetricBase REST APIs see the REST API Explorer on an instance with the MetricBase application installed, or see the Clotho Time Series API.

For information on the MetricBase JavaScript APIs, see Client, Data, DataBuilder, Transformer, TransformPart, TransformResult.

To use MetricBase time series data in report visualizations, see Create time series reports from MetricBase data.

**Analyze time series data with the JavaScript APIs**

This example is to get the average CPU percentage over the specified time for each XYZ computer.
// Query the cmdb_ci_computer table for the records for
var gr = new GlideRecord('cmdb_ci_computer');
gr.addEncodedQuery('manufacturer=xyz');
gr.query();

// Create a DataSelector object and specify the metric
// cpu_percentage, the transform (avg), and label (avg cpu)
var transform = new
sn_clotho.Transformer(gr).addMetric('cpu_percentage').avg().label('avg-cpu-percentage');

// Run the transform between startTime and endTime.
// startTime and endTime are GlideDateTime
var data = transform.execute(startTime, endTime);
var values = data['avg-cpu-percentage'].getValues();

View time series data

You can view time series data for a metric. A metric is defined for all records in a table, and you can view
the time series data for all records.

Role required: admin

See the Create time series reports from MetricBase data topic to create advanced reports.

1. Navigate to the table containing the metric.
   In the Filter Navigator, type <table name>.list, and hit enter.
2. Click the menu icon above the metric column, and select Time Series Chart.
3. Change the Time Span and Transform fields to evaluate the data.
   When you select the Add, Multiply, or Divide transforms, the Value field and Submit button are shown.
Enter a value and click Submit to view the adjusted data. The adjusted data is not saved to the
MetricBase database.

View MetricBase status

You can view the status of the MetricBase database.

Role required: admin

1. Navigate to MetricBase MetriBase Status.
   A list of MetricBase statistics is shown. Each item is information about the MetricBase database. Use
   the personalize icon to add fields to the form. Then, click on a metric to view the time series data.
2. Set up the list to show the information that you want to check.
   a) Click the Update Personalized List icon.
   b) Use the slushbucket to move the desired metric to the display, and click OK.
3. Click the metric value to view the time series data for that statistic.

Debug MetricBase

You can use session debug tools and statistics to debug issues.
Role required: admin

1. To use MetricBase session debug.
   a) Navigate to System Diagnostics Session Debug Debug MetricBase. Session debug tracking for MetricBase activities starts.
   b) Navigate to MetricBase MetricBase Status, and scroll to the bottom of the list. Debug information is listed below the list.

2. To view MetricBase statistics
   a) Navigate to System Diagnostics Stats Stats
   b) Scroll down to find MetricBase Statistics

MetricBase demonstration application

Investigate an example application that uses MetricBase features. The demonstration application is in the MetricBase Demo plugin.

The demonstration application contains a table that has metric fields defined. Triggers have been created for evaluating data as it is added to the MetricBase database. A scheduled job that runs every five minutes adds data to the MetricBase database. You can use the Data Explorer module to experiment with transform APIs.

The MetricBase Demo application has these modules.

Table 594: MetricBase Demo modules

<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drones</td>
<td>A table created for this application. You can add records.</td>
</tr>
<tr>
<td>Fleets</td>
<td>A table created for this application. It provides a mechanism for grouping drones. You can add records.</td>
</tr>
<tr>
<td>Data Generators</td>
<td>A table defining how data is created for the drone records. This is provided for informational purposes. You cannot change or add records.</td>
</tr>
<tr>
<td>Metrics</td>
<td>Shows the metrics defined for the system. This is the same table as MetricBase Time Series Metrics. You can add metric fields.</td>
</tr>
<tr>
<td>Scheduled Jobs</td>
<td>Shows the scheduled job created for the demonstration application. The job runs every five minutes to add data to the MetricBase database. You can change the schedule.</td>
</tr>
</tbody>
</table>

Note: When you hit the back button, you are taken to the system Scheduled Script Executions table that shows all scheduled scripts in the system. Use the Navigator to return to the demonstration modules.
<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triggers</td>
<td>Shows the triggers defined for the system. This is the same table as MetricBase Triggers Trigger Definitions. You can create triggers.</td>
</tr>
<tr>
<td>Anomaly Logs</td>
<td>Shows a list of anomaly logs. The Low-Flying Drone trigger creates the anomaly logs.</td>
</tr>
<tr>
<td>Data Explorer</td>
<td>Provides a form for experimenting with MetricBase APIs using the demonstration application's data. See MetricBase Data Explorer for more information.</td>
</tr>
</tbody>
</table>

**MetricBase Data Explorer**

Experiment using MetricBase APIs on the data created by the demonstration application.

Role required: admin

The Data Explorer screen has three sections, the Data Explorer Script Result Display on top, the Data Explorer Script area in the middle, and the Server Output area on the bottom.

**Note:** You may need to scroll down the screen to see the bottom two sections. The buttons are located below the script field.

The Data Explorer Script Result Display is initially blank.

The Data Explorer Script section is initially contains a script that you can run. The results of the script are shown in the Data Explorer Script Result Display. Using the Example Script list you can select one of the provided scripts. You can modify the scripts provided or write your own scripts.

**Note:** If you want to keep a modified script or a script you create, you will need to save the script separately.

The Server Output section is initially empty. You can add gs.info() statements to a script to provide debug information that shows in the Server Output section.

1. Navigate to MetricBase Demo Data Explorer.
2. To execute a script, click Run.
3. To change the script to be run.
   a) Select a script from the Example Script list.
   b) Click Load Example.
   c) Click Run.

**Domain separation and MetricBase**

This is an overview of domain separation and the MetricBase application. Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.
Overview

Support: Data only

Domain separation in this application is supported at the Data only level, meaning it supports the data security model of separating visibility of data from one domain to another. To learn more, see Application support for domain separation.

MID Server

The ServiceNow® MID Server application facilitates communication and movement of data between the platform and external applications, data sources, and services.

Explore
• Upgrade to London
  • Introducing the MID Server on page 1579
• MID Server installation on page 1587
• Create the MID Server user and grant the role on page 1591
• Configure a default MID Server for each application on page 1633
• Configure an IP address range for the MID Server on page 1634

Set up

Administer
• MID Server parameters on page 1648
• MID Server properties on page 1644
• MID Server cluster configuration on page 1713
• MID Server privileged commands on page 1678
• MID Server capabilities on page 1716

Use
• The MID Server dashboard on page 1626
• Manage ECC Queue content for a MID Server on page 1712

Troubleshoot and get help
• MID Server troubleshooting on page 1719
• Ask or answer questions in the ITOM community
• Search the HI knowledge base for known error articles
• Contact ServiceNow Support

Introducing the MID Server

The Management, Instrumentation, and Discovery (MID) Server is a Java application that runs as a Windows service or UNIX daemon on a server in your local network.

The MID Server facilitates communication and the movement of data between a ServiceNow instance and external applications, data sources, and services.

This video gives you an overview of the MID Server:
Applications that use MID Servers

<table>
<thead>
<tr>
<th>ServiceNow applications</th>
<th>Other applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Discovery</td>
<td>• Import Sets</td>
</tr>
<tr>
<td>• Orchestration</td>
<td>• Altiris</td>
</tr>
<tr>
<td>• Service Mapping</td>
<td>• Microsoft SMS/SCCM</td>
</tr>
<tr>
<td>• Event Management</td>
<td>• LANDesk Maintenance Suite</td>
</tr>
<tr>
<td>• Operational Intelligence</td>
<td>• HP OpenView Operations</td>
</tr>
<tr>
<td>• Cloud Management</td>
<td>• Microsoft System Center Operations Manager (SCOM)</td>
</tr>
<tr>
<td></td>
<td>• Borland StarTeam Integration</td>
</tr>
<tr>
<td></td>
<td>• Microsoft MIIS</td>
</tr>
<tr>
<td></td>
<td>• Service Assurance</td>
</tr>
</tbody>
</table>

Communicating with the MID Server

The MID Server initiates all communications with the ServiceNow® instance. The instance never initiates communications with the MID Server. This communication is recorded as records in the ECC queue, which is essentially the communication log between the instance and the MID Server. See The MID Server ECC Queue on page 1710 for more information.

MID Server selection

An application can select a MID Server in these ways.

• Auto-selection: The application can automatically find an appropriate MID Server that meets the necessary selection criteria. The criteria is different for each application.
• Default selection: The application defaults to a single MID Server that you can specify for each application.

See MID Server selection on page 1630 for details.

Asynchronous Message Bus

The MID Server opens a persistent connection to the instance through the Asynchronous Message Bus (AMB) Client and listens on the /mid/server/<mid_sys_id> AMB channel. When an output record is inserted into the Queue [ecc_queue] table, an AMB message is sent to the MID Server’s channel. The MID Server receives this message and immediately polls the ecc_queue table for work.

The MID Server polls the ECC queue on the regular interval defined in the mid.poll.time configuration parameter, regardless of AMB message activity. The default polling interval is set to 40 seconds, but can be reconfigured. This polling of the ECC queue at a regular interval is done in case the AMB connection is dropped.
Figure 307: MID Server ECC queue polling process

Note: The AMB client on the MID Server does not work in all environments and might need to be disabled to avoid performance issues. To disable AMB in your environment, set the mid.disable_amb parameter to true. When you disable AMB, the MID Server reverts to a default polling interval of 5 seconds, unless the mid.poll.time parameter is set to a different value.
System clones and the MID server

See KB0547597 for information on what to do with MID Servers when you are cloning your instance.

Using guided setup to implement a MID Server

MID Server guided setup provides a sequence of tasks that help you configure a MID Server on your ServiceNow instance. To open MID Server guided setup navigate to Guided Setup ITOM Guided Setup.

For more information about using the guided setup interface, see Using guided setup.

MID Server heartbeat

The Now Platform checks the MID Server for a response every 5 minutes, using a synthetic transaction monitoring system.

Checking for a heartbeat

ServiceNow instances send a synthetic transaction via the Heartbeat probe to every MID Server every 5 minutes. The Heartbeat probe functions exactly as a normal probe does and is sent by writing an output record to the ECC queue. A MID Server retrieves the record when it queries the ECC queue for work. The MID Server processes the probe just as it would any other probe and responds back to the instance. If the instance does not detect a response from a MID Server, the instance marks that MID Server as Down. If the MID Server responds, the instance considers the MID Server to not be Down and is communicating properly with the instance.

Note: Make sure that your MID Server can communicate on port 443. See Configure MID Server network connectivity on page 1590 and MID Server system requirements on page 1583 for more information.

System events

When a MID Server transitions from one state to another, one of these events is triggered:

- mid_server.up: The MID Server goes from a status of Down, Paused, or Upgrading to a status of Up.
- mid_server.down: The MID Server goes from a status of Up to a status of Down.
- mid_server.paused: The MID Server is paused.
- mid_server.upgrading: The MID Server is being automatically upgraded because the instance is being upgraded.

You can use these events to send notifications or trigger actions that you specify in scripts.

Scheduled job

To change the trigger interval for the Heartbeat probe, navigate to System Scheduler Scheduled Jobs Scheduled Jobs. Open the MID Server Monitor record and edit the interval.
Figure 308: MID Server heartbeat trigger interval

MID Server system requirements

Use these minimum system requirements to allocate resources for computers hosting MID Servers.
MID Server supported systems

The following systems support the MID Server.


  **Note:** .NET Framework version 3.5, 4.0, 4.5, 4.6, or 4.7 is required for Service Mapping support and for Windows pattern-based discovery.

• Linux: The MID Server is supported on Linux Red Hat 6 and above, Ubuntu 12 and above, and CentOS 6 and above. Linux MID Servers support virtual machines and 64-bit systems. On 64-bit Linux systems, you must install the 32-bit *GNU C library* (glibc). The installation command for CentOS is: `yum install glibc.i686`.

Java version support

The MID Server installer package does not include the Java Runtime Environment (JRE). You must install the JRE separately on each MID Server host before running the installer or verify that the correct version is already running on the host. If a supported version is present, ensure that the JAVA_HOME environment variable is pointed to that JRE or that java is available in the PATH environment.

The supported JRE version required for the MID Server host is any version in the Java 1.8 family, later than 1.8.0_152. Java 9 and 10 families are not supported. Both the 32 bit and 64 bit MID Servers use the supported JRE.

  **Note:** There is no change in the way the instance upgrades existing MID Servers to the supported JRE version.

Java Service Wrapper

The MID Server installer includes the Tanuki Java Service Wrapper, version 3.5.34.

Setting the JVM Memory size

The MID Server installs with 1 GB of JVM memory. If the suggested memory size for your product is greater than 1 GB, see *Set the MID Server JVM memory size* on page 1706 for the procedure to override the default setting.

Deployment types

System requirements for your instance are determined by the needs of the individual products you use that require a MID Server.

Standard deployments

The following products are considered “standard” because their MID Servers share the same minimum disk space and memory requirements:

• Discovery
• Event Management
• Integrations
• Orchestration
• Service Mapping

The minimum standard requirements pertain to both a single product and a combined product deployment. You can deploy a single MID Server for multiple standard products without significantly increasing the disk or memory requirements.

High resource deployments

Cloud Management Platform (CMP), alert aggregation and RCA, and Operational Intelligence are processing intensive and require more resources for each MID Server than the standard products. Install MID Servers for these products on dedicated hosts that do not support MID Servers for other products.

Recommended MID Server minimum requirements

All configurations listed here require a quad core processor with a speed of 2 GHz or greater and were calculated for a Windows Server 2012 R2 host.

**Note:** The MID Server minimum system requirements for 25 concurrent threads includes resource overhead that is independent of the number of threads. As a result, the system requirements for 200 threads do not require a linear increase in resources.

<table>
<thead>
<tr>
<th>Product</th>
<th>Disk space (GB)</th>
<th>Memory (GB)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OS</td>
<td>MID Server + product</td>
</tr>
<tr>
<td>Alert aggregation and RCA</td>
<td>36 GB</td>
<td>10 GB</td>
</tr>
<tr>
<td>Cloud Management Platform (CMP)</td>
<td>36 GB</td>
<td>4 GB</td>
</tr>
<tr>
<td>Operational Intelligence</td>
<td>36 GB</td>
<td>16 GB</td>
</tr>
<tr>
<td>Standard</td>
<td>36 GB</td>
<td>4 GB</td>
</tr>
</tbody>
</table>

Table 596: MID Server minimum system requirements for 200 concurrent threads (customer configured)

<table>
<thead>
<tr>
<th>Product</th>
<th>Disk space (GB)</th>
<th>Memory (GB)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OS</td>
<td>MID Server + product</td>
</tr>
<tr>
<td>Alert aggregation and RCA</td>
<td>36 GB</td>
<td>10 GB</td>
</tr>
</tbody>
</table>
### Table 597: One MID Server for multiple standard products

<table>
<thead>
<tr>
<th>Product</th>
<th>Disk space (GB)</th>
<th>Memory (GB)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OS</td>
<td>MID Server + product</td>
</tr>
<tr>
<td>Cloud Management Platform (CMP)</td>
<td>36 GB</td>
<td>4 GB</td>
</tr>
<tr>
<td>Operational Intelligence</td>
<td>36 GB</td>
<td>16 GB</td>
</tr>
<tr>
<td>Standard</td>
<td>36 GB</td>
<td>4 GB</td>
</tr>
</tbody>
</table>

Use case 1: Single MID Server deployed for multiple standard products

In this example, Service Mapping, Discovery, and Orchestration share a MID Server with 25 threads that is installed on a dedicated host. The disk space and memory requirements specified here satisfy the minimum recommended requirements for the combined product deployment.

### Table 598: Calculating resources for multiple MID Servers on a single host

<table>
<thead>
<tr>
<th>Product</th>
<th>Disk space (GB)</th>
<th>Memory (GB)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OS</td>
<td>MID Server + product</td>
</tr>
<tr>
<td>MID Server 1</td>
<td>36 GB</td>
<td>4 GB</td>
</tr>
<tr>
<td>MID Server 2</td>
<td>4 GB</td>
<td></td>
</tr>
<tr>
<td>MID Server 3</td>
<td>4 GB</td>
<td></td>
</tr>
</tbody>
</table>

Use case 2: Multiple MID Servers deployed to a single host

In this example, three MID Servers (not clustered) are assigned to different standard products. All three MID Servers are deployed to a single host, where each MID Server has 25 threads. The required resources are calculated as follows:

- **Total disk space required**: Add the recommended disk space for the operating system from the OS column to the sum of the values in the MID Server + product column for all products mapped.
- **Total memory required**: Add the recommended memory for the operating system from the OS memory column to the sum of the values in the JVM memory column for all products mapped.
<table>
<thead>
<tr>
<th>Product</th>
<th>Disk space (GB)</th>
<th>Memory (GB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS</td>
<td>MID Server + product</td>
<td>Total</td>
</tr>
<tr>
<td>Recommended minimum</td>
<td>36 GB</td>
<td>12 GB</td>
</tr>
</tbody>
</table>

**Monitoring performance**

To ensure that the MID Server resource allocations are sufficient for your environment, monitor performance during peak periods of product execution from the *MID Server dashboard*.

**MID Server version compatibility**

The version of the MID Server must be compatible with the version of the instance. Otherwise, the MID Server cannot process commands or communicate with the instance.

The instance determines which version of the MID Server is allowed. The MID Server version must at minimum belong to the same major release, such as Helsinki. If the MID Server version belongs to the same major release, it can, but does not have to, belong to the same minor version, such as Helsinki Patch 1. In this case, communication with the instance might still be possible, but it is always suggested that you upgrade to the latest version.

**Caution:** You can pin the MID Server to a specific version using the `mid.version.override` property, but you should be aware that the version might become out of date.

For more information on upgrades, see *MID Server upgrade* on page 1619.

**Version indicators**

If the version is not compatible, the MID Server status is not changed to Down in the MID Server dashboard. So it might still appear to be processing commands when it actually is not doing so. You must check the MID Server Version on the dashboard, which is available starting with the Istanbul release.

The icons in the Version column indicates the following:

- **Red:** Incompatible. The MID Server and instance do not belong to the same release. You must upgrade the MID Server and verify that it is not pinned to an older version with the `mid.version.override` property. The MID Server will not be upgraded until the parameter is cleared.
- **Yellow:** Compatible, but an upgrade is recommended. This indicates that the MID Server version belongs to the same family as the instance, but not the same version.
- **Green:** Compatible. No upgrade necessary.
- **Gray:** Incompatible. The instance cannot detect the version.

See *KB0535181* for additional MID Server troubleshooting information.

**MID Server installation**

The installation of the MID Server requires you to satisfy certain connection prerequisites and create a MID Server user before you download and install the MID Server on a host machine. All MID Servers must be validated before they can be used.
Using guided setup to implement a MID Server

MID Server guided setup provides a sequence of tasks that help you configure a MID Server on your ServiceNow instance. To open MID Server guided setup, navigate to Guided Setup ITOM Guided Setup. For more information about using the guided setup interface, see Using guided setup.

MID Server installation and setup process

To install and configure a MID Server, perform these tasks in the order shown here:

1. Configure communication between the MID Server and the instance on the appropriate port and enable the required web services. See Configure MID Server network connectivity on page 1590 for details.

2. Create the MID Server user and grant that user the mid_server role.

3. Download the installer file for the host machine.

4. Install the MID Server on a Linux or Windows host.

5. Test the MID Server connection to the instance.

6. Validate the MID Server to ensure that it is trusted to access credentials used by the instance for automations.

7. Configure MID Server parameters, which control various aspects of MID Server functionality, including proxy servers, debugging, and upgrade.

MID Server connection prerequisites

Before you install the MID Server, perform the necessary prerequisites that it needs to connect to elements inside and outside your network. This includes network privileges and security considerations.

Network privileges

The host machine must have these network privileges:

- Firewall access: Configure any firewalls between the MID Server and the target devices to allow a connection. If your network uses a DMZ, and if your network security protocols limit port access from within the network to the DMZ, you might have to deploy a MID Server to a machine within the DMZ to probe the devices there.
- Network access: Configure target devices to allow the MID Server probe to connect. If network security prevents you from configuring new machines that can connect to the targets, install the MID Server on an existing machine with connection privileges.
- Network account: Install the MID Server with the proper account, either local or domain administrator.

Additionally, for the MID Server to access your ServiceNow instance, satisfy these prerequisites:

- Network access to the ServiceNow instance: Configure the network that the MID Server uses to allow traffic over TCP port 443.
- A MID user: Create a ServiceNow user record for the MID Server to use. This user record must have the mid_server and import_admin roles.

Note: Verify that the baseline public page InstanceInfo is active for the MID Server to connect to the instance.
Security considerations

Sometimes computers or devices have additional security measures configured, and these measures may interfere with the MID Server's ability to run commands or queries on those systems.

For example, a Linux server might be configured to allow only certain IP address to connect to it via SSH. Similarly, a network router might be configured to allow only certain IP address to query SNMP on it. To allow access in such cases, use one of the following methods:

• Update the configuration of those computers or devices to allow the desired MID Server to run commands or query them. For example, a network router may be configured to only allow the network management systems to query SNMP on it. In that case, add the MID Server as though it were another network management system.
• Install a MID Server on a computer that already has access to the computers or network devices with such restrictions. For example, to use Discovery within a DMZ (where communication from outside the DMZ will be severely restricted), install a MID Server on a computer that is already in the DMZ.

External connectivity requirements

These requirements are specifically for the use of MID Servers with the ServiceNow Discovery and Orchestration products.

The MID Server communicates securely on port 443 to the instance and requires no inbound connections. In some cases, it might be necessary to allow this communication through the firewall if the MID Server fails to register on the instance. To determine if the application or a network security restriction is to blame for connection failure, attempt to telnet to the instance on port 443 from the server that is hosting the MID Server application. If this connection fails, then the problem could be a web proxy (since 443 is an https connection) or a Firewall rule preventing external TCP connections from that host. Contact network security personnel for the proxy information to add to the config.xml file, or request that the firewall be configured to allow access using one of the following syntaxes:

• <source IP> to <any>
• <source IP> to <ServiceNow> any established
• <source IP> to <instance_name.service-now.com> 443

The MID Server installer download process has changed for new instances in the London release. Access to install.service-now.com is no longer required for the MID Server host machines in your environment. When you request a MID Server installer, the download is performed by the instance, not the MID Server host. This change does not require any additional configuration. Customer instances hosted in a ServiceNow® datacenter have access to install.service-now.com automatically.

Existing MID Servers on upgraded instances do not have the code required to make upgrade requests through the instance and must have access to install.service-now.com for auto-upgrades. During the first MID Server upgrade, however, these MID Servers receive the updates they need to request future upgrades from the instance. You can then configure these MID Servers to send upgrade requests to the instance or continue using the existing download process. All new MID Servers installed for upgraded instances are equipped to make their upgrade requests through the instance.

Internal connectivity requirements

These methods are used for discovering various devices on a network and are specifically for the use of MID Servers with the ServiceNow Discovery and Orchestration products.

• SSH: For UNIX-like machines, Discovery and Orchestration use SSH protocol, version 2 to access target machines. SSH is a network protocol that allows data to be exchanged using a secure channel
between two networked devices. SSH communicates on port 22 within an encrypted datastream and requires a login to access the targets using two available methods of authentication: a user name and password combination and a user name and shared private key. Specify SSH authentication information and type in the Credentials module. If multiple credentials are entered, the platform tries one after the other until a successful connection is established or all are ultimately denied. To provide for application relationships a limited number of SUDO commands must be available to be run. Additional details to these requirements can be found in UNIX/Linux commands requiring root privileges for Discovery and Orchestration.

- **WMI**: For Windows machines, Discovery uses the **Windows Management Instrumentation (WMI)** interface to query devices. Due to security restrictions for WMI, the MID Server application executing the WMI queries must run as a domain user with local (target) administrator privileges. When Discovery detects activity on port 135, it launches a WMI query. The response from the Windows device is sent over a Distributed Component Object Model (DCOM) port configured for WMI on Windows machines. This can be any **port**. Ensure that the MID Server application host machine has access to the targets on all ports due to the unique nature of the WMI requirements.

- **Windows PowerShell** is built on the Windows .NET Framework and is designed to control and automate the administration of Windows machines and applications. Orchestration uses PowerShell to run Workflow activities on Windows machines. PowerShell must be installed on any MID Server that executes these activities. MID Servers using PowerShell must be installed on a supported Windows operating system. ServiceNow supports PowerShell 2.0 and 3.0. Orchestration activities for PowerShell require a credentials Type of **Windows**.

- **SNMP - Network**: For network devices, Discovery uses an **SNMP scan** to get device specific MIBs and OIDs. SNMP is a common protocol used on most routers, switches, printers, load balancers and various other network enabled devices. Use a **community string** (password) for authentication when scanning a device via SNMP. Many devices have a default community string of public which Discovery uses by default when querying a target. Define additional community strings in the **SNMP credentials** form which are tried in succession, along with public, until a successful query returns. In addition to the credentials, the platform also requires the ability to make SNMP requests on port 161 from the MID Server to the target. If Access Control Lists (ACLs) are in place to control the IP addresses that can make these queries, ensure that the IP address of the MID Server is in the ACL. ServiceNow Discovery supports SNMP versions 1, 2c, and 3.

- **WBEM**: Web-Based Enterprise Management (WBEM) defines a particular implementation of the Common Information Model (CIM), including protocols for discovering and accessing each CIM implementation. WBEM requires either of two ports, 5989 or 5988 and uses the HTTP transport protocol. WBEM supports SSL encryption and uses CIM user name/password credentials. ServiceNow Discovery launches a WBEM port probe to detect activity on the target ports and to append gathered data to a classification probe that explores CIM Servers.

### Configure MID Server network connectivity

Before attempting to install and configure the MID Server, prepare your network to allow the MID Server to connect with the ServiceNow® instance.

**Role required**: admin

1. Configure the network to allow MID Server network connectivity to the ServiceNow instance over TCP port 443.
2. Configure basic authentication for SOAP communications with the ServiceNow instance.
3. Navigate to System Web Services Scripted Web Services Scripted SOAP Services.
4. Confirm that the following web services are active:
   - GetMIDInfo
   - InstanceInfo
   - MIDAssignedPackages
   - MIDFieldForFileProvider
   - MIDFileSyncSnapshot

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5. Type sys_public.list in the navigation search field and press Enter.
The Public Pages record list appears.
6. Verify that the InstanceInfo public page is active, to allow the MID Server to validate its version.

Create the MID Server user and grant the role

Create the MID Server user ID and grant this user the role it needs to communicate with the instance.
Role required: admin

The MID Server connects to an instance by using the SOAP web service. To allow authentication with the instance, create a separate user account for each MID Server or share the same account across multiple MID Servers. Grant each MID Server user the mid_server role, which is required for the MID Server user on any instance on which basic authentication is enabled. The mid_server role allows the MID Server to access protected tables when strict SOAP security is in place. The system adds the necessary SOAP roles automatically with this role.

**Note:** The strict SOAP security feature, enabled by default for any instance that uses basic authentication, protects all tables with Access Control Lists (ACL).

1. From the instance, navigate to User Administration Users.
2. Click New.
3. Complete the fields in the form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User ID</td>
<td>User name for the MID Server user. This name is specified in the mid.instance.username parameter of the configuration file that the MID Server installer creates. For details, see MID Server parameters on page 1648.</td>
</tr>
<tr>
<td>First name</td>
<td>The user's first name.</td>
</tr>
<tr>
<td>Last name</td>
<td>The user's last name.</td>
</tr>
<tr>
<td>Password</td>
<td>Password for the MID Server user. This password is specified in the mid.instance.password parameter of the configuration file that the MID Server installer creates.</td>
</tr>
</tbody>
</table>

4. Right-click the header and select Save.
5. Under the Roles related list, click Edit.
6. Select the mid_server role for this user.
   Each MID Server account must have this role to access protected tables.

**Important:** The mid_server and security_admin roles are incompatible and cannot be assigned to the same user. For information on how the instance checks role assignments, see MID Server role validation on page 1592

7. Click Save.
8. Confirm that the MID Server account was created successfully and the account has connectivity to the instance.
   a) On the host machine where you intend to install the MID Server, open a browser and navigate to the instance.
   b) Use your new MID Server user credentials to log in.
      If the login is successful, then any MID Servers you install on that host will be able to connect to the instance.

MID Server role validation

Real-time system validation of MID Server role assignments prevents incompatible settings.

To prevent MID Server validation failure and ensure that your MID Server is configured correctly, the system runs several business rules that monitor the roles and settings you select for your MID Server user. The instance displays a warning and blocks the change when you attempt to save an incompatible configuration.

Elevated privileges not permitted

The mid_server role cannot be configured for elevated privileges. The Invalid MID Server settings business rule runs on the Role [sys_user_role] table and prevents the elevated_privileges field from being set to true for the mid_server role.
Figure 309: Warning for elevated privileges on the mid_server role

Relationship table protection

The User Role [sys_user_has_role] table creates the relationship between the [sys_user] and the [sys_user_role] tables.

- Incompatible role

The mid_server and security_admin roles are incompatible and cannot be assigned to the same user. The system determines the user’s current role and runs the Security Admin incompatible with MID business rule on the User Role [sys_user_has_role] table. This rule prevents an administrator from adding the security_admin role for a user who currently has the mid_server role.
Figure 310: Warnings for incompatible security_admin role assignment

- Incompatible user role and user record settings
  
The Incompatible MID Server user role business rule runs on the User Role [sys_user_has_role] table to protect its data from incompatible configurations. Validation for this related table ensures that an administrator cannot assign the mid_server role to a user who:
  
  - Already holds the security_admin role.
  - Has the web_service_access_only field set to true.
  - Has the internal_integration_user field set to true.
### Warning Messages:

1. A user with the 'Web-Service Access' option set to true cannot be granted the mid_server role.
2. A user cannot be granted both the mid_server and security_admin roles.
3. "MD Server" role assignment rejected.

### User Details:

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>User ID</td>
<td>tyree.courregge</td>
</tr>
<tr>
<td>Email</td>
<td><a href="mailto:tyree.courregge@example.com">tyree.courregge@example.com</a></td>
</tr>
<tr>
<td>Language</td>
<td>-- None --</td>
</tr>
<tr>
<td>Calendar integration</td>
<td>Outlook</td>
</tr>
<tr>
<td>Time zone</td>
<td>System [US/Pacific-New]</td>
</tr>
<tr>
<td>Date format</td>
<td>System [yyyy-MM-dd]</td>
</tr>
<tr>
<td>Business phone</td>
<td></td>
</tr>
<tr>
<td>Mobile phone</td>
<td></td>
</tr>
</tbody>
</table>

### Related Links:

- View Subscriptions
- Reset a password
Incompatible user record settings

Certain settings in the user record are not permitted with the mid_server role. The User settings incompatible with MID business rule runs on the User [sys_user] table to monitor the settings of the web_service_access_only and internal_integration_user check boxes. If the user has the mid_server role, this rule prevents either of these fields from being set to true.

![User settings](image)

Figure 312: Incompatible MID Server settings

**Note:** If you upgrade from a previous release with incompatible MID Server roles and settings, the system displays the appropriate warning messages when any change is made to the tables monitored by these business rules. If the change is unrelated to any role and settings validation, the system permits the updates and simply warns you of the existing incompatibilities. If the changes violate any compatibility rules in the Jakarta release, the business rules enforce the restrictions appropriately.

Download the MID Server files

The MID Server application is downloadable from the ServiceNow instance.

**Note:**
The MID Server installer download process has changed for new instances in the London release. Access to install.service-now.com is no longer required for the MID Server host machines in your environment. When you request a MID Server installer, the download is performed by the instance, not the MID Server host. This change does not require any additional configuration. Customer instances hosted in a ServiceNow® datacenter have access to install.service-now.com automatically.

You download the MID Server and then enable Discovery, Orchestration, or any integration that requires the use of the MID Server.

2. Select and download the MID Server for the appropriate operating system.
   There might be a few seconds delay while the instance processes the request and initiates the download.
Figure 313: MID Server downloads

3. Save the download file to a temporary file on the local drive.
4. Move the file into the designated MID Server folder you create for your operating system and run the installer from that location.
   - Linux
   - Windows

Install a MID Server on Linux

The MID Server installer automates the installation of a MID Server on a Linux computer.

Verify that the host computer meets the MID Server system requirements.

Role required: admin, mid_server

**Important:** The MID Server installer package does not include the Java Runtime Environment (JRE). You must install the JRE separately on each MID Server host before running the installer or verify that the correct version is already running on the host. If a supported version is present, ensure that the JAVA_HOME environment variable is pointed to that JRE or that java is available in the PATH environment.

You can install a MID Server on a 32-bit or 64-bit Linux computer. Click this link to view the installation video:

1. Verify that the MID Server host has the correct JRE installed.
The supported JRE version required for the MID Server host is any version in the Java 1.8 family, later than 1.8.0_152. Java 9 and 10 families are not supported.

2. If the MID Server host does not have the JRE installed or is running an unsupported version, download and install the correct version, and then configure either of the following:
   • Set the JAVA_HOME environment variable to point to a supported JRE.
   • Make java available in the PATH running environment.

3. From the Linux command line, type `mkdir -p /servicenow/mid server name` to create the installation directory. You need to have read/write/execute permissions on this folder.

4. Extract the downloaded MID Server archive file, `mid.os.zip` into the `/servicenow/mid server name/` directory. Use the MID Server name created in the instance or create a new name that you will use for this MID Server moving forward.
   The resulting directory structure is `/servicenow/<mid server name>/agent`.

5. Change to the `/servicenow/mid server name/agent` directory, and enter the following command to start the MID Server installer: `./installer.sh`.
   If you prefer to manually configure the MID Server instead, skip to this step.

6. Use the installer to enter the following information.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ServiceNow instance URL</td>
<td>Enter the full URL of your instance, for example:</td>
</tr>
<tr>
<td></td>
<td><a href="https://mycompanyinstance.service-now.com">https://mycompanyinstance.service-now.com</a></td>
</tr>
<tr>
<td>ServiceNow MID Server username</td>
<td>Enter the user name of the MID Server user that you already created. The MID Server user must have the mid_server role.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>ServiceNow MID Server password</td>
<td>Enter the password for the user in the ServiceNow MID Server username.</td>
</tr>
<tr>
<td>Use proxy</td>
<td>Select this check box if your MID Server communicates through a proxy to connect to the instance.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Your proxy server must use Basic Authentication for the MID server to connect to the instance.</td>
</tr>
<tr>
<td>Proxy host</td>
<td>Enter the proxy server host name or IP address. Do not include the protocol in the host name. For example, enter proxyserver.domain.com, not <a href="https://proxyserver.domain.com">https://proxyserver.domain.com</a>.</td>
</tr>
<tr>
<td>Proxy port</td>
<td>Enter the port through which the proxy server communicates. If you leave this field blank, it should use the proxy server's default port number.</td>
</tr>
<tr>
<td>Proxy username</td>
<td>Enter the user name that has administrator rights to the proxy server.</td>
</tr>
<tr>
<td>Proxy password</td>
<td>Enter the password for the user name.</td>
</tr>
</tbody>
</table>

7. Click Test your connection to validate the credentials and instance information. If you encounter any errors, verify the information that you input.

8. Click Next.

9. Configure the MID name parameters (see table).
Table 599:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MID Server name</td>
<td>Enter any MID Server name.</td>
</tr>
<tr>
<td>MID Service wrapper name</td>
<td>Modify this field if necessary. It is populated automatically by prefixing snc_mid_ to the MID Server name. In most cases, you do not need to modify this.</td>
</tr>
<tr>
<td>MID Server wrapper display name</td>
<td>Modify this field if necessary. It is populated automatically by prefixing ServiceNow MID Server_ to the MID Server name. In most cases, you do not need to modify this.</td>
</tr>
</tbody>
</table>

10. Click Next to view the summary.
11. Click Start MID Server.
   The local host starts the MID Server.

When the MID Server service starts, it verifies that it is the only active (not down) MID Server with that name. If the MID Server discovers another active MID Server with the same name, the starting MID Server waits 5 minutes and sends another query. The MID Server repeats this query three times and logs each attempt in the agent log. If the MID Server still detects a duplicate after this cycle, it creates a record in the *MID Server Issue [ecc_agent_issue] table* and shuts itself down.

**Note:** The record in the MID Server Issue [ecc_agent_issue] table cannot be resolved automatically by the instance. Close this record manually for accounting purposes. Either mark the issue Resolved or delete it.
12. Click Mid Servers List Page.
The installer opens the MID Server list from your instance.

13. Select the MID Server name from the list.

   **Note:** It may take a few seconds for the MID Server time to establish a connection with your instance.

   The system displays the MID Server record.

14. From Related Links, click Validate.
The MID Server Validated changes to Yes.

15. To configure the MID Server manually, change to the servicenow/mid server name /agent directory, and then edit the config.xml file as follows:
   a) Find the element `<parameter name="url" value="https://YOUR_INSTANCE.service-now.com" />` and change the value to the URL of your instance.
   b) Enter the MID user credentials in the mid.instance.username and mid.instance.password parameters.
      By default, the MID Server, uses basic authentication for SOAP messages. The password value is also encrypted authentication.
   c) Find the `<parameter name="name" value="YOUR_MIDSERVER_NAME_GOES_HERE" />` element and change the value for the MID Server name.
   d) Enter connection information for the proxy server. Remove the appropriate comment tags from the proxy configuration information.
      For example, you can configure these parameters:
      - mid.proxy.use_proxy
      - mid.proxy.host
      - mid.proxy.port
      - mid.proxy.username
      - mid.proxy.password

16. Start the MID Server and verify that it is active.
   a) In the MID Server home directory (agent), execute the shell script start.sh to start the new MID Server.
   b) Log into the instance and navigate to MID Servers Servers to verify that your new MID Server has a Status or Up.
      Additional log information appears here:
      - The MID Server log on the instance.
      - The corresponding `agent0.log.0` and wrapper logs (`wrapper.log`) in the MID Server `agent/logs` folder.

17. To configure the MID Server to restart automatically when the host is restarted, run `${base_install_dir}/agent/bin/mid.sh install` as root to add the auto start scripts to the init.d directory.

18. To stop the MID Server, navigate to the MID Server home (agent) directory and execute the stop.sh shell script.

19. To restart a stopped MID Server, use either of these procedures:
   - In the instance, navigate to MID Servers Servers and open the record for a Down server. Under Related Links, click Restart MID.
   - Navigate to the MID Server home (agent) directory and execute the restart-service.sh script, using one of these commands:
Configure **MID Server parameters**, which control several aspects of MID Server functionality, including proxy servers, debugging, and upgrade.

### Uninstall a Linux MID Server

The MID Server runs as a stand-alone service. You can remove a stand-alone MID Server service to accommodate such tasks as redeploying the MID Server to another host machine or changing the unique name of a MID Server when deploying multiple MID Servers.

**Role required:** admin

1. From the MID Server home directory (agent directory) type `stop.sh`.
2. From a command prompt, go to the `agent\bin` directory in the MID Server installation directory.
3. Confirm that the MID Server is stopped by executing the `bin/mid.sh status` shell script.
4. After the MID Server stops, delete the files in the agent directory.

### Install a MID Server on Windows

The MID Server installer automates the installation of a MID Server on a Windows computer.

**Verify that the host computer meets the MID Server system requirements.**

**Role required:** admin or mid_server

---

**Important:** The MID Server installer package does not include the Java Runtime Environment (JRE). You must install the JRE separately on each MID Server host before running the installer or verify that the correct version is already running on the host. If a supported version is present, ensure that the JAVA_HOME environment variable is pointed to that JRE or that java is available in the PATH environment.

---

You can install one or more MID Servers on a supported Windows computer. Click this link to view the installation video:

1. Verify that the MID Server host has the correct JRE installed.
   - The supported JRE version required for the MID Server host is any version in the Java 1.8 family, later than 1.8.0_152. Java 9 and 10 families are not supported.
2. If the MID Server host does not have the JRE installed or is running an unsupported version, download and install the correct version, and then configure either of the following:
   - Set the JAVA_HOME environment variable to point to a supported JRE.
   - Make java available in the PATH running environment.
3. Log in to the Windows host machine where you want to install the MID Server.
4. Create a folder for the MID Server on the top level of the drive such as `ServiceNow\MID Server1`.
5. Download the MID archive file into the new folder.
6. Right-click the archive and select Extract All.
7. Navigate to the `service-now\<mid server name>\agent` folder that was created when the file was extracted.
8. Run `installer.bat` to start the MID Server installer.
To configure the MID Server manually, skip to this step.

9. Use the installer to enter the following information.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ServiceNow instance URL</td>
<td>Enter the full URL of your instance, for example:</td>
</tr>
<tr>
<td></td>
<td><a href="https://mycompanyinstance.service-now.com">https://mycompanyinstance.service-now.com</a></td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>ServiceNow MID Server username</td>
<td>Enter the name of the MID Server user that you already created. The MID Server user must have the mid_server role.</td>
</tr>
<tr>
<td>ServiceNow MID Server password</td>
<td>Enter the password for the user in the ServiceNow MID Server username.</td>
</tr>
<tr>
<td>Use proxy</td>
<td>Select this check box if your MID Server communicates through a proxy to connect to the instance.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Your proxy server must use Basic Authentication for the MID server to connect to the instance.</td>
</tr>
<tr>
<td>Proxy host</td>
<td>Enter the proxy server host name or IP address. Do not include the protocol in the host name. For example, enter proxyserver.domain.com, not <a href="https://proxyserver.domain.com">https://proxyserver.domain.com</a>.</td>
</tr>
<tr>
<td>Proxy port</td>
<td>Enter the port through which the proxy server communicates. If you leave this field blank, it should use the proxy server's default port number.</td>
</tr>
<tr>
<td>Proxy username</td>
<td>Enter the user name that has administrator rights to the proxy server.</td>
</tr>
<tr>
<td>Proxy password</td>
<td>Enter the password for the user name.</td>
</tr>
</tbody>
</table>

10. Click Test your connection to validate the credentials and instance information. If you encounter any errors, verify the information that you input.
11. Click Next.
12. Configure the MID name parameters (see table).
Configure MID name parameters

*MID Server name: My_Windows_MID_Server

MID Service wrapper name: snc_mid_My_Windows_MID_Server

MID Service wrapper display name: ServiceNow MID Server_My_Windows_MID_Server

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MID Server name</td>
<td>Enter any MID Server name.</td>
</tr>
<tr>
<td>MID Service wrapper name</td>
<td>Modify this field if necessary. It is populated automatically by prefixing snc_mid_ to the MID Server name. In most cases, you do not need to modify this.</td>
</tr>
<tr>
<td>MID Server wrapper display name</td>
<td>Modify this field if necessary. It is populated automatically by prefixing ServiceNow MID Server_ to the MID Server name. In most cases, you do not need to modify this.</td>
</tr>
</tbody>
</table>

13. Click Next to view the summary.
14. Click Start MID Server.
   The local host starts the MID Server.
   
   When the MID Server service starts, it verifies that it is the only active (not down) MID Server with that name. If the MID Server discovers another active MID Server with the same name, the starting MID Server waits 5 minutes and sends another query. The MID Server repeats this query three times and logs each attempt in the agent log. If the MID Server still detects a duplicate after this cycle, it creates a record in the **MID Server Issue [ecc_agent_issue] table** and shuts itself down.

   **Note:** The record in the MID Server Issue [ecc_agent_issue] table cannot be resolved automatically by the instance. Close this record manually for accounting purposes. Either mark the issue Resolved or delete it.
15. Click Mid Servers List Page.
The installer opens the MID Server list from your instance.

16. Select the MID Server name from the list.

*Note:* It may take a few seconds for the MID Server time to establish a connection with your instance.

The system displays the MID Server record.

17. From Related Links, click Validate.
The MID Server Validated changes to Yes.

18. To configure the MID Server manually, edit the config.xml file with a text editor such as WordPad:

   a) Find the element `<parameter name="url" value="https://YOUR_INSTANCE.service-now.com" />` element and change the value to the URL of your instance.

   b) Enter the MID user credentials in the mid.instance.username and mid.instance.password parameters.
      By default, the MID Server, uses basic authentication for SOAP messages. The password value is also encrypted authentication.

   c) Find the `<parameter name="name" value="YOUR_MIDSERVER_NAME_GOES_HERE" />` element and change the value for the MID Server name.

   d) Enter connection information for the proxy server. Remove the appropriate comment tags from the proxy configuration information.
      For example, you can configure these parameters:
      - mid.proxy.use_proxy
      - mid.proxy.host
      - mid.proxy.port
      - mid.proxy.username
      - mid.proxy.password

19. Start the MID Server and verify that it is active.

   a) In the MID Server home directory (agent), execute the batch file start.bat to start the new MID Server.

   b) Log into the instance and navigate to MID Servers Servers to verify that the Status of your new MID Server is Up.
      Additional log information appears here:
      - The MID Server log on the instance.
      - The corresponding agent0.log.0 and wrapper logs (wrapper.log) in the MID Server agent/logs folder.

20. To stop the MID Server, use either of these procedures:

   - Windows command line: From the MID Server home directory (agent) run stop.bat.
   - Windows Services console: Right click ServiceNow <MID Server name>, and then select Stop.

21. To restart a stopped MID Server, use any of these procedures:

   - In the instance, navigate to MID Servers Servers and open the record for a Down server. Under Related Links, click Restart MID.
   - Windows command line: In the MID Server home directory (agent), run Restart.bat.
Configure **MID Server parameters**, which control several aspects of MID Server functionality, including proxy servers, debugging, and upgrade.

**Manually install a MID Server as a Windows Service**

If you did not start the MID server at the end of the installation procedure, you can manually install the MID Server to run as a Windows service.

Role required: admin

You can install a MID Server as a Windows service in these operating systems:

- Windows Server 2008
- Windows Server 2012
- Windows Server 2016

1. Open the agent directory in the directory you created for the MID Server installation files. For example, the path might be `C:\ServiceNow\MID Server1\agent`.
2. Right-click the start.bat file, and select Properties.
3. Select the option to Run as administrator.
4. Double-click the start.bat file to install the Windows service.

**Uninstall a Windows MID Server**

The MID Server runs as a stand-alone service. You can remove a stand-alone MID Server service to accommodate such tasks as redeploying the MID Server to another host machine or changing the unique name of a MID Server when deploying multiple MID Servers.

Role required: admin

1. Stop the running MID Server service, using one of these procedures:
   - Windows command line: From the MID Server home directory, for example from the agent folder, type `stop.bat`.
   - Windows Services console: From the Windows Services console, right-click the ServiceNow MID Server name and then select stop.
2. From a command prompt, go to the `\agent\bin` directory in the MID Server installation directory.
3. Double-click the `UninstallMID-NT.bat` file.
4. Check in the Windows Services console for a service named ServiceNow WMI Collector. If it is running, open a command prompt, navigate to `agent\bin\sw_wmi\tools`, and double-click `uninstall_wmi.bat`.

**Test MID Server connectivity**

Confirm network connectivity to the MID Server host or to the instance for automatic upgrades, and then ensure that the MID Server can communicate with the instance.

Role required: admin

The MID Server installer download process has changed for new instances in the London release. Access to `install.service-now.com` is no longer required for the MID Server host machines in your environment.

When you request a MID Server installer, the download is performed by the instance, not the MID
Server host. This change does not require any additional configuration. Customer instances hosted in a ServiceNow® datacenter have access to install.service-now.com automatically.

Existing MID Servers on upgraded instances do not have the code required to make upgrade requests through the instance and must have access to install.service-now.com for auto-upgrades. During the first MID Server upgrade, however, these MID Servers receive the updates they need to request future upgrades from the instance. You can then configure these MID Servers to send upgrade requests to the instance or continue using the existing download process. All new MID Servers installed for upgraded instances are equipped to make their upgrade requests through the instance.

The computer that hosts existing MID Servers in an upgraded system must be able to access one of these URLs to upgrade automatically for the first time:

- HTTPS: https://install.service-now.com on the default HTTPS port (443)
- HTTP: http://install.service-now.com on the default HTTPS port (80)

1. Use PING to test connectivity with the host on the network (ping<host IP>).
2. If no ping response is returned, use TRACEROUTE to see where traffic might be stopped (traceroute<host>).
3. Use TELNET to connect to any of the TCP ports (telnet<host> <port>).
4. Use an SNMP scanning tool to determine if a potential network device is responsive.
5. Resolve the most likely issues around network connectivity:
   - Routing: Confirm that the MID Server host has network access to the IP ranges you are attempting to discover.
   - Firewalls: Confirm access to the physical firewalls that protect a large environment such as the Data Center. Confirm access to any logical firewalls that protect an individual computer. MID Server communications are initiated inside the firewall and therefore do not require any special firewall rules or VPNs.
   - Access Control Lists (ACL): Confirm that ACLs contain the IP addresses based list on SNMP network devices that allows communication to a particular target.
   - Resolve all issues with your network teams to better understand your topology. Deploy additional MID Servers if necessary to help keep your network secure. Configure access from your existing MID Server host to networking components.

6. Verify that the MID Server service is running on the host:
   - Windows: In the Windows Services console, locate the ServiceNow [MID Server name] and confirm that each MID Server has the Started Status value.
   - Linux: Ensure that the agent0.log.0.lck appears in the /servicenow/ MID Server name]/agent folder.

7. After each MID Server restart, open the agent0.log.0 and address all error messages.
8. From the ServiceNow instance, navigate to MID Server Servers.
9. Review and verify that all MID Servers that are connected to the instance are listed.
10. Verify that the Status is Up for the MID Servers.

Validate the MID Server

You must manually validate the MID Server after it is installed to enable it to execute automation tasks. You can invalidate a MID Server you suspect has been compromised to prevent it from accessing automation credentials in the instance or executing outbound ECC probes.

Role required: agent_admin, admin

Make sure that the MID Server version is compatible with the instance.
Validation restricts access to automation credentials to trusted MID servers only.

Starting in the Istanbul release, you can specify that the MID should be used for all capabilities, applications, and IP ranges when you validate a MID Server. You will be prompted to set the initial selection criteria when you validate MID Servers that do not already have capabilities, applications, or IP ranges already configured. You do not have to set the initial selection criteria to actually validate the MID Server. See MID Server selection on page 1630 for more information on capabilities, applications, and IP ranges.

**Note:** When you upgrade to Geneva and later releases, MID Servers that are already configured in your instance are automatically validated. This prevents the interruption of automation tasks that MID Servers might be performing. See MID Server upgrade on page 1619 for more information.

1. Install the MID Server using the instructions in MID Server installation on page 1587. This creates a record in the MID Server [ecc_agent] table.
2. Navigate to MID Server Servers.
3. Open the new MID Server from the list of MID Servers.
4. Under Related Links click Validate.
   The Set Initial Selection Criteria window appears if there are no records in the Supported Applications, IP Ranges, or Capabilities related lists.
5. On the Set Initial Selection Criteria window, use the switches to enable or disable selection criteria for this MID Server:
   • Allow ALL capabilities: Allow all capabilities for Orchestration and Event Management use this MID Server.
     **Note:** Service Mapping and Event Management alert aggregation and RCA, which used capabilities in previous releases, rely on the application for MID Server selection starting with the Istanbul release.
   • Allow ALL applications: Allow all applications that use MID Servers use this MID Server.
   • Allow ALL IP ranges: Make all IP ranges valid for this MID Server, meaning that it can target any IP address.

   ![Set Initial Selection Criteria](image)

   **Figure 314: Setting initial selection criteria**

   If you click Cancel, the validation continues but none of the capabilities, applications, or IP ranges are added.
   6. Click OK.
The Validated field on the dashboard is set to Validating, and then set to Yes after the validation completes.

7. To invalidate a MID Server, open the record for the MID Server you suspect has a security issue.
8. Under Related Links, click Invalidate.

Invalidating a MID Server forces it to clear its memory and restart. The MID Server generates a new keypair on restart.

**Multiple MID Server deployments**

Depending upon how you use the MID Server (for an external integration, Discovery, Service Mapping or Orchestration) and the load placed on it, you might find it necessary to deploy multiple MID Servers in your network.

Factors determining the number of MID Servers your network will require to support external applications that integrate with ServiceNow include the following:

- The security constraints in your network.
- Your network policies.
- The amount of traffic between ServiceNow and the integrations.
- The reliability of the MID Server machines.

**Network policies and security**

Security policies in your network (firewalls between network segments, for example) might make direct communication impossible between your instance and an integration's data source (JDBC, LDAP, etc.). To retrieve data for the instance, you can install a MID Server that has access to both the data source and the instance.

These network policies can determine if you need to install multiple MID Servers in your environment:

- Access control lists (ACL): If your security policy controls access to network devices (e.g. switches and routers) with an ACL, it might be necessary to install one or more MID Servers on a machine in the network that is already on the ACL.
- DMZ: Your network policy might require you to install one or more MID Servers in your DMZ to probe the devices there. This is common in networks that tightly regulate the ports that are opened on the inside firewall.
- Probe types: If you are conducting probes of different operating systems, your network policy might require a separate MID Server for each type of probe (e.g., one MID server for Windows WMI probes and another for SSH probes on UNIX).

**Load balancing**

Deploy multiple MID Servers where capacity is an issue, as when Discovery has to gather information about thousands of configuration items quickly. In a high volume environment, it might be necessary to deploy multiple MID Servers as load balancers for certain transactions. For example, JDBC data transfers can tie up the resources of a MID Server, making it unable to respond to other requests. The following operations between an integration might require separate MID Servers in a busy network:

- File exports
- Running scripts
- JDBC data sources
• Reading files

**High availability model**

Avoid installing MID Servers for critical integrations on a machine that might experience any type of planned outage or an outage caused by overloaded processes. If necessary for reliability, consider deploying these types of MID Servers to dedicated machines for high reliability.

**Note:** Do not integrate with an external application on a MID Server provisioned for ServiceNow Discovery or Orchestration.

**Wide area network (WAN)**

When determining where to deploy MID Servers in a WAN, consider the bandwidth available between your local area networks. In most cases, install a MID Server on each LAN to probe devices locally, rather than deploying MID Servers that must probe devices across slow WAN connections. An alternative to this type of deployment is to install MID Servers that probe other LANs via VPN connections that take advantage of fast Internet connections. If the bandwidth of your WAN connections is comparable to that of your Internet connection, then there is no performance impact in running MID Server probes across WAN connections.

**Domain separation**

In deployments where domain separation is enabled and domains are configured to form a hierarchy, place the MID Servers at the lowest domain level.
Install multiple MID Servers on a single system

You can install multiple MID Servers on the same host computer.

Role required: admin, mid_server

You can install multiple MID Servers on a single host or on a virtual machine using either Linux or Windows. Installing multiple MID Servers may involve other setup steps depending on your network configuration.

1. Log in to the host system or virtual machine where you want to install multiple MID Servers.
2. Create a directory for each MID Server on the top level of the drive.
   Make sure you create a unique and descriptive name for each MID Server, such as MIDSserver_SMS_Int or MIDSserver_Disc1.
3. Extract the downloaded MID Server archive file into each MID Server directory.

Figure 315: Deploying MID Servers with domain separation
When the extract completes, there should be a directory path that resembles the following for each MID Server. For example, ServiceNow<MID Server name>\agent.

4. For each MID Server, run the installer appropriate to the host's operating system.

<table>
<thead>
<tr>
<th>Operating System</th>
<th>Installer path</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows</td>
<td>/agent/installer.bat</td>
</tr>
<tr>
<td>Linux</td>
<td>/agent/installer.sh</td>
</tr>
</tbody>
</table>

5. Use the installer to enter the following information.
   - URL to your instance
   - User credentials to run the MID Server
   - Proxy server connection details
   - MID server name
   - MID server service wrapper name and display name (Windows systems only)

   **Note:** The MID Server user must have the mid_server role.

6. From the installer, click Start MID Server.
The local host starts the MID Server.

7. Click Mid Servers List Page.  
The installer opens the MID Server list from your instance.

8. Select the MID Server name from the list.

  **Note:** It may take a few seconds for the MID Server time to establish a connection with your instance.

The system displays the MID Server record.

The MID Server Validated changes to Yes.
Configure Windows MID Server service credentials

MID Server service credentials are required to manage the MID Server service on the host machine, including its ability to successfully auto-upgrade.

By default, the MID Server service runs as a Local System account. This account has privileges to create and run the MID Server service and to download, create, and move files for the MID Server auto-upgrade process.

Windows service credentials are not the same as the MID Server user credentials, which allow communication between the MID Server and the instance. You must configure both of these credentials separately. See Create the MID Server user and grant the role on page 1591 for instructions on MID Server user credentials.

Attention: This procedure is optional. Allowing the MID Server service to run as a Local System account is sufficient for a majority of users.

1. Open the Windows Services console.
2. Double-click the ServiceNow <MID Server name> service for each MID Server.
3. Select the Log On tab.
4. Set Log on as privileges with the user account (local or on a domain) that has local admin access to the MID Server host.
   The MID Server upgrade process deploys a temporary Windows service which requires local administrator privileges.
5. In the General tab, set the Startup type. The field is set to Automatic by default.
6. Click OK.
7. Restart the ServiceNow <MID Server name> service, and make sure that ServiceNow\<MID Server name>\agent\logs\agent0.log does not have error messages. If the MID Server does not start, see the ServiceNow knowledge article Review the agent log for MID Server errors (article KB0535148).
8. On the instance to which this MID Server is connected, navigate to MID Server Servers. If Discovery is installed, alternately navigate to Discovery MID Servers.
   All MID Servers connected to this instance are listed.
9. Make sure that the Status of the MID Server you just installed is Up.

Monitor the MID Server

Monitoring MID Servers involves verifying entries in log files, confirming network connectivity, and checking MID server status.

Role required: agent_admin or admin

You can monitor MID Servers hosted by Windows or Linux MID servers.

1. For Windows only, navigate to the Windows Services console, locate the service name that matches the name that appears from the wrapper-override.conf file. If the MID Server process is the only Java process running on the host, monitor the memory used by java.exe and alert on less than the maximum configured memory defined in the \agent\conf\wrapper-override.conf folder.
2. Ensure that the agent0.log.0.lck file appears in the \agent\logs folder to confirm that the MID Server running and logging system activity in the agent0.log.0 file.
3. Review the following logs for warning, critical, and severe errors:
   • \agent\logs\agent0.log.0

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See Manage ECC Queue content for a MID Server on page 1712 to see how to open log entries from the instance.

4. **Confirm network connectivity.**

5. From the MID Server instance, navigate to the MID Servers page, and review the status of the MID Server. For additional information, click a Name.

6. **Use Windows or Linux tools to monitor:**
   - CPU
   - Disk utilization
   - Events
   - Memory
   - syslog

Set up email, SMS, and push notifications to alert you when issues occur with MID servers. The MID Server Down notification is enabled by default. See **Notifications** on page 596 for details.

**MID Server upgrade**

MID Servers are automatically upgraded, but you can also manually upgrade each MID Server separately.

**Access to the MID Server download site**

The MID Server installer download process has changed for new instances in the London release. Access to install.service-now.com is no longer required for the MID Server host machines in your environment. When you request a MID Server installer, the download is performed by the instance, not the MID Server host. This change does not require any additional configuration. Customer instances hosted in a ServiceNow® datacenter have access to install.service-now.com automatically.

Existing MID Servers on upgraded instances do not have the code required to make upgrade requests through the instance and must have access to install.service-now.com for auto-upgrades. During the first MID Server upgrade, however, these MID Servers receive the updates they need to request future upgrades from the instance. You can then configure these MID Servers to send upgrade requests to the instance or continue using the existing download process. All new MID Servers installed for upgraded instances are equipped to make their upgrade requests through the instance.

**Note:** Future versions of the platform will require all MID Server download requests to go through the instance.

These system properties control access to the MID Server download site:

- **mid.download.through.instance:** Enables the MID Server download through the instance. This property is set to true for all new instances and sends all auto-upgrade requests through the instance. For upgraded instances, the property is set to false which retains the previous behavior of sending upgrade requests from the MID Server host. To configure MID Server auto-upgrades through the instance, add *this property* to the System Property [sys_properties] table and set it to true.
- **concurrent.dist.download:** Sets the number of concurrent MID Server auto-upgrades permitted by the instance. The default value of this property is 2, which allows the MID Server to use 2 of the 4 semaphores available on the instance for upgrading. If your instance has more than 4 INT semaphores, you can increase the value in this property to allow more concurrent upgrades.
Upgrade methods

- **Automatic**: Allow the instance to automatically upgrade the MID Server. This functionality is available by default. Automatic upgrade occurs:
  - Every hour, when the MID Server checks with the instance to see if there is a different version available for upgrade. You cannot modify this time period.
  - When the instance is upgraded and the MID Server for that version is different than the version currently on the MID Server.
  - When the MID Server pre-upgrade test passes without an error. Any errors encountered during this automatic test prevent the upgrade from occurring until the issues are resolved. The pre-upgrade test is enabled by default, but can be disabled by adding and setting a system property.

- **Manual**: Manually start the upgrade by clicking a related link on the MID Server record. Use this method when you do not want to wait until the next hourly automatic update or if your upgrade failed and you want to force an upgrade. See [Upgrade the MID Server manually](#) on page 1625 for instructions.

The Upgrade state

The instance initiates the upgrade by sending the autoUpgrade system command to the MID Server. Starting with MID Servers upgrading from an Istanbul version MID Server, the MID Server Status is changed to Upgrading while the upgrade is running. The Upgrading state is similar to the Paused state. This is done to avoid potential miscommunication between the new version of the instance and the previous version of the MID Server during upgrade. For the upgrade to run, MID servers must be in the Up state and must be **validated**.

While in the Upgrading state, you cannot resume or restart the MID Server. However, you can perform the same actions that you can when the MID Server is in the Paused state. After a successful upgrade, the queued output is sent to the instance and the MID Server starts retrieving new commands to process. The status also changes to Up.

When the instance sends the autoUpgrade system command to the MID Server, if it is Down or Paused, or if it has not been validated, the command remains in the ECC Queue until the MID Server status changes to Up. Then the command is processed.

**Note**: If you are using an Istanbul instance but you are upgrading a pre-Istanbul MID Server to Istanbul, these upgrade states are not available. They are available only for MID Servers that are already on Istanbul.

Failed upgrades

Failed upgrades are handled differently based on the version you are upgrading to:

- Upgrade to another major release: (such as Istanbul to the next full release): the status changes to Upgrade Failed.
- Upgrade from a minor version within a release (such as Jakarta patch 1 to patch 2): the MID Server continues using the version it is currently running. It does not perform the upgrade and the status eventually changes to Up, assuming the MID Server was already functioning properly.
Upgrading MID Servers in the Down state

If a MID Server is in the Down state, it cannot process the upgrade command. When the MID Server changes to Up, it immediately checks to see if an upgrade is necessary. If it does need to upgrade, the upgrade process starts before the MID Server processes any other commands.

Upgrade error messages

The MID Server can display the following upgrade error messages.

<table>
<thead>
<tr>
<th>Message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unable to refresh packages</td>
<td>Generic error when the error is not handled by a defined error message.</td>
</tr>
<tr>
<td>Failed to query instance for MID Server buildstamp</td>
<td>Instance is unavailable or there is a major version mismatch between the MID Server and the instance.</td>
</tr>
<tr>
<td>Not a valid package buildstamp</td>
<td>InstanceInfo returned an assigned buildstamp that was not in the correct format, such as a version mismatch.</td>
</tr>
<tr>
<td>Method failed (&lt;instance URL&gt;) HTTP/1.1 409 Conflict with code: 409</td>
<td>MID Server auto-upgrade request rejected when number of concurrent upgrades exceeds 2. The configured number of available semaphores for MID Server upgrades on the instance is set at 2 to prevent performance degradation.</td>
</tr>
</tbody>
</table>

| Note: The MID Server re-sends the request every 20 seconds until it can get the semaphore. |

MID Server pre-upgrade check

The instance automatically tests the MID Server's ability to upgrade on your system prior to the actual upgrade, to identify issues that could cause a MID Server outage or require reinstallation.

Each MID Server contains an AutoUpgrade monitor that compares the MID Server version with that of the instance to determine if the MID Server needs to upgrade. If the AutoUpgrade monitor discovers that the MID Server version is out of date, the monitor runs pre-upgrade validation tests for that MID Server. If an issue is detected, a message is logged to the MID Server Issue [ecc_agent_issue] table, and the upgrade is blocked. The AutoUpgrade monitor continues to run every hour, until the tests all pass. If there are no blocking issues, the MID Server downloads the appropriate upgrade package and begins the upgrade process.

Failed tests leave the MID Server in one of these states:

- Upgrade Failed: For upgrades to a different release family, such as from Geneva to Jakarta.
- Up: For upgrades within the same release family, such as an upgrade to a patch.
Errors, such as insufficient disk space for the installer and lack of connectivity to install.service-now.com, are written to both the MID Server agent log and to the MID Server Issue [ecc_agent_issue] table. These errors are published before the actual MID Server upgrade occurs and must be resolved before the upgrade can continue. You can view issues from the MID Server Issue [ecc_agent_issue] table in any of these locations:

- MID Server Issues related list in a MID Server record.
- MID Server Server Issues navigation module.
- MID Server Issues gauge on the MID Server dashboard.

**Attention:** MID Servers on new instances of the London release send upgrade requests to the instance, which then retrieves the installation package from install.service-now.com. MID Servers for upgraded instances cannot request upgrades from the instance and must have access to the download site. After the initial upgrade, these MID Servers can be configured to request upgrades through the instance. See MID Server upgrade on page 1619 for details.

### Pre-upgrade tests

The pre-upgrade validation tests check these requirements:

- At least 1GB of free disk space.
- Access to the download site at install.service-now.com.
- Permission to execute these file operations:
  - Extract a ZIP archive to a temp folder.
  - Copy files from the temp folder to the agent folder.
  - Read a text file.
  - Delete the pre-upgrade contents.
- For Windows, ensure that the Log On As user for the Windows service is either LocalSystem or a user that is part of the local Administrator group. By default, domain administrators are added to the local Administrator group when joining a computer to a domain. If the PowerShell script that performs this test does not return the expected output, the system logs a warning to the MID Server Issue [ecc_agent_issue] table, but the test passes.

### Data provided

When the instance encounters issues during the pre-upgrade check, it populates these fields in the MID Server Issue [ecc_agent_issue] table:

**Table 602: MID Server issue fields**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last detected</td>
<td>Date and time the issue was last detected.</td>
</tr>
<tr>
<td>Short description</td>
<td>Contents of the generated message that specifies a possible issue with available disk space, download server access, or file permissions.</td>
</tr>
<tr>
<td>MID Server</td>
<td>Name of the MID Server affected by a pre-upgrade test failure.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Issue source</td>
<td>The process that identified the issue. For all issues with MID Server pre-upgrade testing, the source is UpgradeCheck.</td>
</tr>
<tr>
<td>State</td>
<td>The current state of the issue. Possible states are:</td>
</tr>
<tr>
<td></td>
<td>• New: Starting state when the instance creates the issue.</td>
</tr>
<tr>
<td></td>
<td>• Acknowledged: State set by the administrator when he or she first examines the issue.</td>
</tr>
<tr>
<td></td>
<td>• Resolved: Ending state, set by the instance, indicating that the issue has been resolved. If the scheduled job does not encounter the issue when it runs again, the instance automatically sets the state to this value.</td>
</tr>
<tr>
<td>Domain</td>
<td>Domain for the MID Server. For all issues derived from MID Server pre-upgrade testing, the domain value is inherited from the domain of the MID Server user.</td>
</tr>
<tr>
<td>Count</td>
<td>Number of times an issue has been detected. Each time the pre-upgrade tests run and encounter the same issue, the AutoUpgrade monitor increments this field.</td>
</tr>
</tbody>
</table>

**Errors that block the upgrade**

These messages describe issues detected by the pre-upgrade test and published to the MID Server Issue [ecc_agent_issue] table. Failure of any of these tests blocks the upgrade.

- Not enough free disk space. The system reports \(<n>\) bytes free: This message is displayed when less than 1GB of free disk space is detected on the MID Server host. This error is also written to the MID Server agent log.
- Unable to download updates from install server: This message indicates that either the instance or MID Server host does not have permission to download the installation package from install.service-now.com, or network problems prevent connection. This error is also written to the MID Server agent log.
- Unable to extract contents of pre upgrade check zip: This message indicates that the service account on the MID Server host does not have permission to extract the pre-upgrade ZIP archive to the temporary folder specified by the system property, java.io.tmpdir. On a UNIX host, the value for this property is typically /tmp or /var/tmp. On Microsoft Windows hosts, the path is c:\WINNT\TEMP.
- Unable to create folder <upgrade check file path>: This message indicates that the MID Server service account does not have permission to create the upgradeCheck folder for the pre-upgrade checking files in the agent/package path.
- Unable to verify file permissions: <message>: This message indicates an exception has occurred when checking file permissions, such as a file that does not exist or access failure.
- MID Server Windows Service is not running as LocalSystem or a local Administrator: This message warns that the Windows service is not running with the desired permissions.
Non-blocking warnings

These warnings are displayed in the MID Server Issue [ecc_agent_issue] table and do not prevent a Windows MID Server from upgrading:

- **WARN: Unable to parse $logOnAsUser**: This message warns that the Log On As User value for the Windows service is not in either of these expected formats:
  - user@domain.company.com
  - domain\user
- **WARN: Unable to look up Log On As user's groups**: When the instance attempts to look up the logged on user's group memberships, it executes the `net user <username>` command. The instance expects a certain output structure by the Windows service from this command and issues this warning if the expected output does not match the actual output.

These PowerShell warnings are written to the MID Server agent log only. Because PowerShell is not required to use a MID Server, these configuration issues do not prevent a Windows MID Server from upgrading. However, these warnings might indicate issues in your environment that require attention.

- **Skipping PowerShell upgrade checks since PowerShell is not usable**: PowerShell 2.0 (at a minimum) is not installed or `powershell.exe` is not available to the MID Server service user.
- **Continuing with upgrade, but the following issue was encountered during upgradeCheck**: `<exception message>`: This message indicates that there was an issue running the PowerShell portion of the pre-upgrade tests.

Disabling the pre-upgrade check

A MID Server configuration parameter called `mid.upgrade.run_precheck` is set to true by default, which allows the automatic pre-upgrade test to run. To disable these tests for a single MID Server, add this parameter to that MID Server's config.xml file and set it to false. To disable these tests for all MID Servers, add a new record to the MID Server Property [ecc_agent_property] table called `mid.upgrade.run_precheck`. Set the value of this property to false and leave the MID Server field blank.

MID Server version selection

You can pin all the MID Servers in your environment to a specific version by setting a system property, or you can configure specific versions for individual MID Servers.

**Note**: Do not pin the MID Server to a specific version for a significant amount of time, especially if you upgrade the instance. Under most circumstances, let the instance determine which MID Server version to use.

Version control properties

These properties control the version for all MID Servers:

- **mid.buildstamp**: Identifies the MID Server version with an identifier based on the date of the build. This property uses a date and time format of `yyyy-mm-dd-hhmm`. The MID Server checks for version information hourly. If no override version is configured, the MID Server looks at the mid.buildstamp property for the version to use. This property resets itself to the default version (the version that matches your instance version) when the instance is restarted or upgraded, so any user changes are lost at that time.
• mid.version.override: Sets an override condition for the current version for all MID Servers in your environment. This action pins the MID Servers to a single version and disables the automatic upgrade feature. This property is not visible in the base system and must be added to the System Property [sys_properties] table when it is set. For details, see Add a property using sys_properties.list.

When the MID Servers check the version each hour, they look at the mid.version.override property first. If this property is empty, the MID Servers get their version information from the mid.buildstamp property. If an override version is configured, the MID Servers use this value and ignore the version information in the mid.buildstamp property. This override value remains when the instance is restarted and is passed to the MID Servers.

Attention: The value in the mid.version.override property is cleared during an upgrade, which forces the MID Server to reset itself to the version in the mid.buildstamp property.

Version control configuration parameter

To pin specific MID Servers on a desired version, set the mid-pinned.version parameter with the name of that version in the config.xml file of each MID Server. This setting overrides the property setting for the pinned MID Server version. For instructions, see Add a MID Server parameter on page 1672.

Note: The value set in this parameter is not affected by an upgrade.

Upgrade the MID Server manually

You can manually upgrade MID Servers at any time if you do not want to wait for the automatic upgrade.

Role required: mid_server or admin

For the upgrade to run, MID servers must be in the Up state and must be validated.

The MID Server is upgraded to the version specified by build stamp on the instance, or by the upgrade property that you specify.

1. Navigate to Discovery MID Servers or Orchestration MID Server Configuration MID Servers.
2. Open the record of the MID Server that you want to upgrade.
3. Click Upgrade MID under Related Links.
4. Confirm that you want to perform the upgrade.

MID Server configuration

Administrators must configure a MID Server to ensure that it has access to sufficient system resources, probes the proper data sources, and communicates with the instance as expected.

You must complete all the steps in MID Server Installation before attempting any of the configuration steps explained here.

Restart a MID Server after any configuration change for the changes to take effect.

Note: All new MID Servers must be validated before use. Validation ensures that the MID Server is trusted to access credentials used by the instance for automations. For instructions, see Validate and invalidate the MID Server.
MID Server Records that cannot be altered

These records cannot be modified or deleted.

<table>
<thead>
<tr>
<th>Table</th>
<th>Record</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Page [sys_public]</td>
<td>InstanceInfo</td>
</tr>
<tr>
<td>Scripted Web Service [sys_web_service]</td>
<td>• InstanceInfo</td>
</tr>
<tr>
<td></td>
<td>• GetMIDInfo</td>
</tr>
<tr>
<td></td>
<td>• MIDAssignedPackages</td>
</tr>
<tr>
<td></td>
<td>• MIDFieldForFileProvider</td>
</tr>
<tr>
<td></td>
<td>• MIDFileSyncSnapshot</td>
</tr>
<tr>
<td></td>
<td>• MIDServeCheck</td>
</tr>
<tr>
<td></td>
<td>• MIDServeFileProvider</td>
</tr>
</tbody>
</table>

Using special characters in an XML file

The XML specification defines five predefined entities that represent special characters, and requires that all XML processors honor them. If these characters are used in a password, you will experience unexpected results.

The following characters represent the five pre-defined entities:

• "
• &
• '
• <
• >

If you use the pre-defined entity characters in an XML file, such as the MID Server configuration file, you need to encode them. To encode pre-defined entities into an XML document:

• replace " with &quot;
• replace & with &amp;
• replace ’ with &apos;
• replace < with &lt;
• replace > with &gt;

For example, to specify the password as test&amp; in the MID Server config.xml file:

```xml
<parameter encrypt="true" name="mid.instance.password" value="test&amp;"/>
```

The MID Server dashboard

The MID Server dashboard is a central place for MID Server users to monitor ongoing operations. The dashboard consists of reports and gauges that display information from the MID Server Status table.

The MID Server Dashboard is available from the MID Server Dashboard module.
The MID Server status gauge

The MID Server Status gauge on the dashboard displays basic information about each MID Server. This information comes from the MID Server Status [ecc_agent_status] table.

<table>
<thead>
<tr>
<th>MID Server Status</th>
<th>Name</th>
<th>Host name</th>
<th>Status</th>
<th>Validated</th>
<th>Version</th>
<th>Max memory used %</th>
<th>Mean CPU used %</th>
<th>Pending jobs</th>
<th>Processing jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Msd1</td>
<td>Msd</td>
<td>Passed</td>
<td>Yes</td>
<td>09-09-2013, 07-20-2016</td>
<td>17.17</td>
<td>1.34</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Msd2</td>
<td>Msd2</td>
<td>Up</td>
<td>Yes</td>
<td>07-10-2016, 06-15-2016</td>
<td>14.06</td>
<td>1.16</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Msd3</td>
<td>Msd3</td>
<td>Down</td>
<td>Yes</td>
<td>12-01-2015, 11-04-2015</td>
<td>29.48</td>
<td>4.27</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Msd4</td>
<td>Msd4</td>
<td>Passed</td>
<td>Yes</td>
<td></td>
<td>58.4</td>
<td>63.3</td>
<td>0</td>
<td>518</td>
</tr>
</tbody>
</table>

Figure 316: The MID Server Dashboard gauge

<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The name of the MID Server.</td>
</tr>
<tr>
<td>Host name</td>
<td>The name of the system that hosts the MID Server.</td>
</tr>
<tr>
<td>Status</td>
<td>The status of the MID Server.</td>
</tr>
<tr>
<td>Validated</td>
<td>Whether or not the MID Server was validated.</td>
</tr>
<tr>
<td>Max memory used %</td>
<td>The highest percent usage of memory on the system that hosts the MID Server, in the configured sampling interval. The default interval is 30 minutes, but this value is user configurable. See MID Server resource threshold alerts on page 1721 for details.</td>
</tr>
<tr>
<td>Mean CPU used %</td>
<td>The average percent usage of CPU on the system that hosts the MID Server, in the configured sampling interval. The default interval is 30 minutes, but this value is user configurable. See MID Server resource threshold alerts on page 1721 for details.</td>
</tr>
<tr>
<td>Pending jobs</td>
<td>Number of pending ECC queue jobs for that MID Server.</td>
</tr>
<tr>
<td>Processing jobs</td>
<td>Number of processing ECC queue jobs for that MID Server.</td>
</tr>
<tr>
<td>Column</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| Version | The version of the MID Server. An icon indicates the validity of the MID Server:  
- Red: Incompatible. The MID Server and instance do not belong to the same release. You must upgrade the MID Server and verify that it is not pinned to an older version with the mid.version.override property. The MID Server will not be upgraded until the parameter is cleared.  
- Yellow: Compatible, but an upgrade is recommended. This indicates that the MID Server version belongs to the same family as the instance, but not the same version.  
- Green: Compatible. No upgrade necessary.  
- Gray: Incompatible. The instance cannot detect the version. |
| User | The login name of the user. An icon indicates the validity of the user:  
- Red: Incompatible. The user does not have the mid_server role or the user does not match the value in the mid.instance.username parameter (in the config.xml configuration file). Reconfigure the MID Server user and verify that it works.  
- Green: Compatible. The user has the mid_server role and matches the user in the configuration file.  

**Note:** The user can also have any of the SOAP roles that the mid_server role inherits. |

**CPU and maximum memory usage**

This graph shows the average percentage of CPU usage on all the systems that host MID Servers in the last 30 days.
This graph shows the average percentage of maximum memory used by all the systems that host MID Servers in the last 30 days.
MID Server selection

You can configure MID Server selection by application, IP address ranges, network capability, or behavior.
MID Server criteria

MID Servers offer these types of criteria that help an application determine which MID Server to use:

- **Application**: The application that you specify on the MID Server. You can designate these applications for a specific MID Server:
  - Discovery
  - Orchestration
  - Service Mapping
  - Event Management
  - Operational Intelligence
  - Cloud Management

  An ALL application option is also available. By default, this option includes all applications except Event Management alert aggregation and RCA, which requires an exclusive MID Server. You can configure which applications are included in the ALL designation.

- **IP address or range**: The IP address or the IP ranges that the MID Server is allowed to work within. You can specify an IP address or IP range in the application, such as on a Discovery schedule or an Orchestration activity, and for the MID Server. If the IP configured in the application matches the IP address or falls within the allowable IP range configured on the MID Server, a match is possible, and that MID Server passes this criteria. To have the instance automatically assign IP ranges (subnets) to available MID Servers, see MID Server IP range auto-assignment on page 1640.

- **Capabilities**: The network capability an application needs to use, such as the PowerShell Orchestration activity or the Flow Designer PowerShell step on page 1296. Some applications, like Cloud Management and alert aggregation and RCA, require a specific capability.

  **Note**: Discovery and Service Mapping can also use behaviors, which determine the type of port probes used during the port scan phase of Discovery. Both Discovery and Service Mapping use a behavior to discover load balancers running on Linux. Other applications do not use behaviors. Behaviors are not used for auto-selection, default MID Servers, or specific MID Servers as described below. See Discovery behaviors for more information.

How an application selects a MID Server

If you do not specify a specific MID Server for an application to use, the application tries to select one. Each application relies on different criteria to select an appropriate MID Server.

<table>
<thead>
<tr>
<th>Application</th>
<th>Supported Application on the MID Server</th>
<th>IP address range</th>
<th>Capability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discovery (Select Auto-Select MID Server on the Discovery schedule)</td>
<td>The Discovery or ALL application must be specified on the MID Server.</td>
<td>Discovery uses IP ranges that you configure on the Discovery Schedule form to see if they fall within the IP ranges that you configure on the MID Server, or the ALL IP ranges option must be selected on the MID Server.</td>
<td>N/A</td>
</tr>
</tbody>
</table>

  **Note**: Any configured behaviors are ignored.
<table>
<thead>
<tr>
<th>Application</th>
<th>Supported Application on the MID Server</th>
<th>IP address range</th>
<th>Capability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orchestration</td>
<td>The Orchestration or ALL application must be specified on the MID Server.</td>
<td>The target IP address that you configure in an Orchestration activity must fall within the IP ranges that you configure on the MID Server, or the ALL option must be selected on the MID Server.</td>
<td>The capability that is required for an Orchestration activity must match the capabilities you configure on the MID Server, or the MID Server capability must be set to ALL.</td>
</tr>
<tr>
<td>Alert aggregation and RCA (as part of Event management)</td>
<td>The Service Analytics application must be specified on the MID Server.</td>
<td>N/A</td>
<td>One of these capabilities must be present on the MID Server: the RCA capability for alert aggregation and RCA and the Metrics capability for Operational Intelligence.</td>
</tr>
<tr>
<td>Service Mapping</td>
<td>The Service Mapping or ALL application must be specified on the MID Server.</td>
<td>The endpoint IP address must fall within the IP range that you configure on the MID Server, or the ALL option must be selected on the MID Server.</td>
<td>One of the supported Service Mapping capabilities (for new installs) must be configured on the MID Server, or the MID Server capability must be set to ALL.</td>
</tr>
<tr>
<td>Event Management</td>
<td>The Event Management or ALL application must be specified on the MID Server.</td>
<td>The IP configured in the event connector instances, such as HPOM, must fall within the IP range configured on the MID Server.</td>
<td></td>
</tr>
<tr>
<td>Cloud Management</td>
<td>N/A</td>
<td>N/A</td>
<td>The Cloud Management or ALL capability must be added.</td>
</tr>
</tbody>
</table>

**Using a specific MID Server**

Discovery and Event Management can use a MID Server that you specifically call out.

**Note:** Selecting a specific MID Server is not the same as specifying the default MID Server for an application. A specific MID Server is always used. If it is Down or not validated, the application does not execute commands against the MID Server. A default MID Server is fallback that is used when the auto-selection of MID Servers does not find any eligible MID Server.
Application | How you specify a specific MID Server | Criteria that the default MID Server must meet
---|---|---
Discovery | Choose the MID Server on the Discovery schedule. | You can use any MID Server as long as it does not have the RCA capability. If you select a MID Server for the Discovery or ALL application, it automatically adds the Discovery application. 

**Note:** You can also specify a cluster of MID Servers.

Orchestration | N/A | N/A
Alert aggregation and RCA | N/A | N/A
Service Mapping | N/A | N/A
Event Management | Choose one or more MID Servers on the connector instance event collection, such as HPOM. | N/A
Cloud Management | N/A | N/A

**Note:** If a MID Server manages resources within defined IP ranges for Orchestration, you must map the fully-qualified domain name (FQDN) of a server with its IP address to run certain activities, such as Exchange activities.

### Domain separation

If you are using domain separation, you can configure MID Servers to be in separate domains. The domain that the MID Server is in affects how the application selects the domain:

- **Discovery and Service Mapping:** On the Discovery schedule, the MID Servers and clusters that available for selection are limited to the same domain of the user who is configuring the schedule. This also applies to the auto-selection option: only MID Servers in the same domain as the user can be automatically selected.

- **Alert aggregation and RCA (Event Management):** The metrics for a business service is done on the MID Server that is in the same domain as the business service. Otherwise, a MID Server from the global domain is used.

### MID Server selection test

If Service Mapping is active, you can preview which MID Server that Service Mapping uses for a specific target device or computer. To do this, navigate to Service Mapping MID Servers and click MID Selection Test. Enter the IP address and an optional application and capability, and then click OK. The name of the MID Server that Service Mapping will use appears in the window.

### Configure a default MID Server for each application

You can configure a default MID Server that an application can use if all other possible MID Servers are unavailable.

**Role required:** agent_admin or admin

Applications are only available when their respective plugins are activated.

The default MID Server is used when applications fail to find a suitable MID Server that matches configured criteria during auto-select. The default MID Server for the ALL application is used if the default
MID Server for the specific application is not available. Some applications also offer a property to set the default MID Server.

**Important:** If you configure a MID Server for ALL IP ranges (type Include) and also create an IP range of type: Exclude for the same MID Server, the system ignores the excluded IP range for that MID Server.

The default MID Server does not need to meet any criteria (application, IP range, behavior, or capability) to be used. Specifying a default MID Server is optional, and you can use a MID Server as the default for more than one application.

<table>
<thead>
<tr>
<th>Application</th>
<th>Additional notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discovery</td>
<td>Discovery attempts to use the default MID Server when the Discovery schedule specifies Auto-Select MID Server and Discovery cannot find any MID Servers with the correct application and IP range.</td>
</tr>
<tr>
<td>Orchestration</td>
<td>Orchestration attempts to use the default MID Server when it cannot find any MID Servers with the capabilities that you define in the Orchestration activity. You can also specify a default MID Server. The value in that property automatically synchronizes with the default MID Server you select in the Orchestration application.</td>
</tr>
<tr>
<td>Alert aggregation and RCA</td>
<td>Not applicable. The MID Server is selected if it has the RCA capability. Route to right MID by domain.</td>
</tr>
<tr>
<td>Service Mapping</td>
<td>If there are no MID Servers with matching application, capability, or IP range, Service Mapping uses the default MID Server.</td>
</tr>
<tr>
<td>Event Management</td>
<td>You can specify a default MID Server for Event Management using the mid.server.connector_default system property. Event Management does not use the default MID Server in the application record.</td>
</tr>
<tr>
<td>Cloud Management</td>
<td>N/A</td>
</tr>
</tbody>
</table>

1. Navigate to **MID Server Applications**. The list of installed applications that can use MID Servers appears.
2. Click the name of an installed application.
3. Select a MID Server from the list in the Default MID Server field.
4. To select additional MID Servers for this application, click Edit in the MID Servers related list and select alternate MID Servers that this application is allowed to use.
5. Click Update.

**Configure an IP address range for the MID Server**

You can manually configure an IP address range for the MID Server to explore.

Role required: agent_admin or admin

Applications, such as Discovery and Orchestration, can specify an IP range or the specific IP address of a target. When the application looks for a MID Server to use during auto-selection, it chooses a MID Server whose IP range includes the application's range or specific IP address. Applications also use other criteria, such as the MID Server's supported application or capability. See **MID Server selection** on page 1630 for more information.
**Note:** This is a manual configuration procedure. To learn how the system can assign IP address ranges to selected MID Servers automatically, see *MID Server IP range auto-assignment* on page 1640.

These applications use IP ranges as follows:

- **Orchestration:** Use the IP address of the target machine (together with the capability) to select the correct MID Server for Orchestration activities. Refer to the procedure in this topic to configure the IP address.

- **Service Mapping:** Select the MID Server whose IP address range matches the IP in the discovery request. See *MID Server configuration for Service Mapping* for more information.

- **Discovery:** Can select an IP address range using the same criteria as Service Mapping. Discovery can also use a *quick IP range* that you specify in the Discovery schedule.

**Tip:** You can also use the ALL IP range, which allows the MID Server to be used with any range of IP addresses that an application specifies. This only allows the MID Server to access IP ranges, it does not mean that the MID Server can actually reach all of the IP ranges. To function with an application, the MID server must have access to the IP ranges that the application needs.

Valid IP address ranges can be as follows:

- **An IP address in dotted decimal or hexadecimal format.** The hexadecimal format can be explicitly prefixed with 0x, this is not mandatory. Here are examples:
  - 10.11.144.155
  - 0xA0B909B
  - A0B909B

- **An IP address range in dotted decimal or hexadecimal format.** Here are examples:
  - 10.11.144.150-10.11.144.160
  - 0xA0B9096-0xA0B90A0
  - 10.11.144.150-0xA0B90A0

- **An IP network address with the net mask specified after a slash (/) in regular notation (0-32 inclusive) or in IP address notation.** Dotted decimal or hexadecimal format is not allowed. Here are examples:
  - 10.11.144.0/24 10.11.144.0/255.255.255.0
  - 10.11.144.0/FFFFFF00
  - 0xA0B9000/24
  - 0xA0B9000/FFFFFF00

1. Navigate to **MID Server IP Ranges**.
2. Click **New**.
3. Complete the form, using the fields in the table.
Figure 318: IP address ranges

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a descriptive name.</td>
</tr>
<tr>
<td>Application</td>
<td>Application scope for this IP range. The default is Global.</td>
</tr>
</tbody>
</table>
### Field Description

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
</table>
| Type    | Select the type of range:  
- **Include**: Include the specified IP range.  
- **Exclude**: Exclude the IP address range.  

**Note:** If a MID Server is configured for ALL applications, any IP addresses configured for exclusion are ignored by the system. If your goal is to configure default MID Servers for separate applications in your system, see [Configure a default MID Server for each application](#) on page 1633.

<table>
<thead>
<tr>
<th>Range</th>
<th>Enter the range in a valid format.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Related list</td>
<td>The MID Servers that can use this IP address range.</td>
</tr>
</tbody>
</table>

4. Click Save.

**Important:** IP ranges assigned manually prior to using auto-assignment in the Discovery Quick Start are affected as follows:

- Individual IP ranges are retained and appended to the ranges assigned automatically by the system for the designated MID Server.
- If the MID Server was configured with the ALL ranges selection, the auto-assignment feature overwrites that designation with the ranges it finds.

Open the ALL IP range record and configure the MID Servers that you want to use with any set of IP addresses.

### Select applications to include in the definition of ALL for a MID Server

You can narrow down the list of applications that are included in the definition of ALL.

**Role required:** agent_admin or admin

You can specify the ALL application for a MID Server, which means that the MID Server is allowed to work with any of the applications that require MID Servers, such as Discovery, Event Management, Service Mapping, and so on. But you might not want all applications to be included in the definition of ALL. For example, you might want to exclude Service Mapping from all the ALL definition if you already have a dedicated MID Server to work with Service Mapping.

1. Navigate to MID Server Applications.
   The list of installed applications that can use MID Servers appear.

2. If you do not see the Included in application ALL column, you can personalize the list and add it.
3. For each application, double-click the value in the Included in application ALL column.
4. Change the value to true (to include) or false (to exclude).

Override the MID Server selection filter

You can use the override feature to write your own filter condition that overrides the normal MID Server selection criteria for an application. An override has precedent over the default filter and can be defined for a specific selection condition.

Before attempting to create an override filter, be sure you understand the criteria the platform uses to select MID Servers. See MID Server selection on page 1630 for details.

Role required: admin

**Note:** In the London release, the override feature is intended for Cloud Management and Cloud Discovery only. The Override by capability filter is provided by default.

There are four MID Server selection filters included in the base ServiceNow system. These filters are applied to all MID Servers in order until the system finds a matching condition:

- Status Filter
- App Filter
- Capability Filter
- IP Filter

**Important:** The override feature allows multiple filter types but only one override filter for each filter type. The Override selector filter type overrides all other filters and takes complete control of the MID Server selection. If this type is active, it is the only filter applied.

1. Navigate to MID Server Mid Selector Override.
   The list of MID Server overrides appears.
2. Click New to create a new filter.
3. Complete these fields:
   - Name: Unique name for this override. Ensure that you can identify the override type by the name.
   - Script: Condition for this filter. Create the MID Server selection logic for your override in this field, using the directions provided in the function template. Look at the Override by capability filter as an example before starting to create your filter.
• Type: Type of override being configured. Select one of the four default filters to override with your condition, or select Override selector to create a filter that overrides all the others.

4. Click Submit.

```javascript
(function filter(candidateMIDList) {
    // Check if this is cloud capability - if not nothing to do
    if (!hasCloudCapability) {
        return defaultSelectedMIDList;
    }

    // get first non cloud capability (e.g AWS) - there should be only one more
    var capability = getNonCloudCapability(requestedParameters.capabilities);
    if (JSUtil.isNullOrEmpty(capability)) {
        return defaultSelectedMIDList;
    }

    // get mid with AWS capability
    var mids = getMidsWithCapability(capability);
    if (mids.length > 0)
```
MID Server IP range auto-assignment

IP ranges that represent a subnet can be automatically assigned to qualified MID Servers by the Discovery Quick Start feature.

To be automatically assigned to a subnet, a MID Server must be:

- In a running (Up) state.
- Successfully validated.
- Able to access one or more subnets in your network.

The subnet assignments that the instance makes for your MID Servers are stored in the Automation Status Set [automation_status_set] table. For details about MID Server auto-assignment, see Discovery Quick Start.

**Important:** You must auto-assign at least one MID Server to create a schedule automatically.

Required SNMP OIDs for MID Server IP range auto-assignment

Customers who use network service providers must request specific SNMP access to use MID Server IP range auto-assignment.

IP range auto-assignment requires SNMP credentials for read-only access to all routers that Discovery uses to identify subnets. In addition, your service provider must grant the following SNMPWALK access:

- iso.org.dod.internet.mgmt.mib-2.ip.ipRouteTable (1.3.6.1.2.1.4.21)
  - ipRouteDest (1.3.6.1.2.1.4.21.1.1)
  - ipRouteNextHop (1.3.6.1.2.1.4.21.1.7)
  - ipRouteType (1.3.6.1.2.1.4.21.1.8)
  - ipRouteMask (1.3.6.1.2.1.4.21.1.11)
- iso.org.dod.internet.mgmt.mib-2.ip.ipForward.ipCidrRouteTable (1.3.6.1.2.1.4.24.4)
  - ipCidrRouteDest (1.3.6.1.2.1.4.24.4.1.1)
  - ipCidrRouteMask (1.3.6.1.2.1.4.24.4.1.2)
  - ipCidrRouteNextHop (1.3.6.1.2.1.4.24.4.1.4)
  - ipCidrRouteType (1.3.6.1.2.1.4.24.4.1.6)

View automation status sets and IP range assignments

The Automation Status Set form shows summary details of a subnet Discovery and the subsequent IP range assignments for MID Servers selected for automatic subnet assignment.

Role required: admin

1. Navigate to MID Server Automation Status Sets.
2. Select a status record for a subnet Discovery you want to view.
   The form contains read-only status information about the selected Discovery, the subnets found, and the range assignment process for the MID Servers you selected for auto assignment.

**Important:** IP ranges assigned manually prior to using auto-assignment in the Discovery Quick Start are affected as follows:

- Individual IP ranges are retained and appended to the ranges assigned automatically by the system for the designated MID Server.
• If the MID Server was configured with the ALL ranges selection, the auto-assignment feature overwrites that designation with the ranges it finds.
The Automation Status Set shows the IP range assignments for the MIO Servers selected for automatic range configuration. All auto-populated MIO Server ranges from this process are subnets only. This form includes summary details of the Discovery that identified the available subnets and their ranges.

<table>
<thead>
<tr>
<th>Number</th>
<th>STA0001003</th>
<th>Subnet discovery status</th>
<th>DIS0010022</th>
</tr>
</thead>
<tbody>
<tr>
<td>State</td>
<td>Completed</td>
<td>Range assignment status</td>
<td>DIS0010023</td>
</tr>
</tbody>
</table>

Subnet Discovery Status: Range Assignment Status

This tab shows information for the currently running Subnet Discovery.

<table>
<thead>
<tr>
<th>Number</th>
<th>DIS0010022</th>
<th>State</th>
<th>Active</th>
</tr>
</thead>
<tbody>
<tr>
<td>Started</td>
<td>62</td>
<td>Created</td>
<td>2017-03-24 14:24:25</td>
</tr>
<tr>
<td>Completed</td>
<td>31</td>
<td>Updated</td>
<td>2017-03-24 15:07:41</td>
</tr>
<tr>
<td>Duration</td>
<td>43 Minutes</td>
<td>Duration</td>
<td></td>
</tr>
</tbody>
</table>

Related Links

Refresh

MIO Servers Used

Go to Name Search

MIO Servers

Name Host name Status Validated Version Logged in user

Actions on selected rows...
3. Select the Subnets Discovered related list to view the list of subnets available for assignment.

![List of subnets associated with a discovery status]

4. Select the IP Range Assignments related list to view the IP ranges that were assigned to a MID Server.

**Caution:** IP ranges identified by Discovery are stored in the IP collection [ip_address_collection] table, which is only used for MID Server IP range auto-assignment in the Jakarta release. This table is intended for future development and should not be used in any customizations, including column additions, business rules, or scripting actions.
MID Server properties

Properties control the behavior of all MID Servers or a particular MID Server.

The MID Server properties are in the MID Server Property [ecc_agent_property] table and can be accessed by navigating to MID Server Properties. You must add these properties if they are not already present.

Table 603: MID Server properties

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| mid.discovery.max_pattern_payload_size      | Defines the maximum overall payload size for the payload of results that come from patterns.
<p>|                                             | • Type: integer (bytes)                                                    |
|                                             | • Default value: 300000                                                    |
|                                             | You can also configure this as a configuration parameter on a individual MID Server. |</p>
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| **mid.discovery.max_payload_size** | Specifies the maximum string length of Discovery results that the MID Server sends to the instance. If the Discovery probe results exceed the limit, the MID Server discards them and returns a warning message.  
For probes, this applies only to those probes where the Used by Discovery field is true. For patterns, this applies to the Horizontal Pattern probe.  
Set the value to any negative number to disable the payload limit and allow payloads of any size to be sent to the instance. For example, -1.  
  - Type: integer (bytes)  
  - Default value: 5000000  
You can also configure this as a configuration parameter on a individual MID Server. |
| **mid.eccq.max_payload_size** | Specifies the maximum string length of a payload that the MID Server sends to the instance. The MID Server verifies the size of the payload before sending it to the instance. If the payload size exceeds the limit, the MID Server discards it and returns an error message in the payload.  
  - Type: integer (bytes)  
  - Default value: 20000000  
You can also configure this as a configuration parameter on a individual MID Server. |
| **mid.max_ci_count_per_page** | Defines the size of each chunk in a payload of results that come from patterns. The chunk can be greater than this parameter value, depending on the relationships of the CIs.  
  - Type: integer (bytes)  
  - Default value: 300000  
You can also configure this as a configuration parameter on a individual MID Server. |
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mid.property.jdbc_operations</td>
<td>Tells the JDBCOrchestrationProbe what JDBC operations it is allowed to execute. Edit this property value to allow JDBC Orchestration activities to perform more operations. All operations are comma separated. Select a MID Server in the MID server field to define specific operations for that MID Server, or leave the field empty to apply the list of operations to all MID Servers. This property requires the Orchestration plugin.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: select,update,insert,delete,show,create,describe,begin,if,end,not,exists</td>
</tr>
<tr>
<td>mid.property.jms.command.allowed_factory_names</td>
<td>Comma delimited list of Java Messaging Service (JMS) connection factories that the MID Server requires for a custom JMS activity or action. This property requires the Orchestration plugin.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: connectionFactory, queueConnectionFactory, topicConnectionFactory</td>
</tr>
<tr>
<td>mid.property.powershell.command.script.parameter_passing</td>
<td>Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: false</td>
</tr>
<tr>
<td>mid.property.ssh.use_snc</td>
<td>Enables the use of the SNCSSSH client for Discovery and Orchestration. Change this property to false to use J2SSH. This property applies to all MID Servers connected to the instance.</td>
</tr>
<tr>
<td></td>
<td><strong>Important</strong>: If you upgrade from Dublin or earlier and want to use the SNCSSSH client, you must add this property to the MID Server Properties [ecc_agent_property] table and set it to true. If you do not set this property, all the MID Servers in the upgraded system will use J2SSH.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td>mid.servicewatch.max_concurrent_connections</td>
<td>Defines the maximum number of concurrent tasks sent to an individual host by a single MID Server.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 7</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>glide.stored_proc.data_type.validation</td>
<td>Stops validation of data types in stored procedure parameters. Use this property if you use Orchestration to run a stored procedure on MySQL, Oracle DB, and MS-SQL databases and you want to avoid performing data type validation. Restart the MID Server service after you change the value of this property.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: false</td>
</tr>
<tr>
<td>mid.process_flow.log_listener.max_size</td>
<td>Sets the maximum size in bytes of memory available to save log messages for Flow Designer actions running on a MID Server. The MID Server stores up to the limit in memory and discards additional log messages, then sends the messages back to the instance along with the execution plan.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer (bytes)</td>
</tr>
<tr>
<td></td>
<td>• Default value: 10485760</td>
</tr>
</tbody>
</table>

Create a MID Server property

Use a MID Server property to control either the behavior of all MID Servers or a particular MID Server.

Role required: admin

You set MID Server properties to override MID Server parameters. Configure MID Server properties in the MID Server plugin. Do not configure MID Server properties in the glide.properties file that is located in the properties folder of the agent. The glide.properties file gets overwritten during the upgrade process.

1. Navigate to MID Server Properties.
2. Click New.
3. Fill in the fields, as appropriate (see table).

Table 604: MID Server properties fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter the property name.</td>
</tr>
</tbody>
</table>
Field | Description
--- | ---
Value | You can enter the value you want the property to have.  

**Note**: If you are amending JDBC operations through the mid.property.jdbc_operations properties, you can enter verbs like BEGIN, END, IF, or common PL/SQL block statements. This will assist in being able to run CREATE or ALTER statements. You might have to restart the MID server before running some of the statements.

MID Server | Leave this field blank to set a MID Server property that affects all MID Servers. To set a MID Server property for a particular MID Server, select the MID Server.

4. After setting any MID Server properties, restart the MID Server to ensure the properties sync with the instance.

**MID Server parameters**

Parameters control the behavior of a particular MID Server and have lower precedence than MID Server properties.

**Important**: Changes to parameters only take effect when the MID Server is started (or restarted).

**Required parameters**

**Note**: Using special characters in an XML configuration file requires you to encode them.

<table>
<thead>
<tr>
<th>Description</th>
<th></th>
</tr>
</thead>
</table>
| **Instance** | the URL to the associated instance. Normally the URL is similar to https://instance.service-now.com, where you replace `instance` with the instance name. If you host your own instance, use the URL set by your organization.  
• Type: string  
• Default value: none |
| **mid_sys_id** | the MID Server record's unique identifier. This parameter should be empty when you initially configure a MID Server. Do not change the value.  
• Type: string  
• Default value: automatically set (GUID) |
<table>
<thead>
<tr>
<th>Description</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| Use this parameter to supply a name that is meaningful for you. If you do not supply this parameter, the MID Server uses the default value. A set of business rules synchronizes the name in the configuration file with the name in the MID Server record. The business rules ensure that changing the name in one location also changes the name in the other location. | MID | Type: string  
Default value: YOUR_MIDSERVER_NAME_GOES_HERE |
| If the ServiceNow instance has authentication enabled, as it is by default, set this parameter to define the user name the MID Server should use to log in to the instance. This user should have the mid_server role on the ServiceNow instance in order to access necessary tables and fields. You can use this parameter to define user names with special characters. | Instance user name | Type: string  
Default value: none |
| If your ServiceNow instance has authentication enabled, as it is by default, set this parameter to define the password the MID Server should use to log in to the instance. You can use this parameter to define passwords with special characters. | Instance password | Type: string  
Default value: none |

### CIM parameters

<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| Maximum number of messages sent at once to a CIM server. | mid.cim.batch.size | Specifies the maximum number of messages sent at once to a CIM server.  
Type: integer  
Default value: 1 |
| Interval to wait between requests to the same CIMOM (ms). | mid.cim.request.interval | Specifies the number of milliseconds to wait between requests to the same Common Information Model Object Manager (CIMOM).  
Type: integer (milliseconds)  
Default value: 0 |
| The maximum amount of simultaneous connections allowed per CIMOM. | mid.cim.host.connection.limit | Specifies the maximum number of simultaneous connections to each Common Information Model Object Manager (CIMOM). A value of zero disables simultaneous connections.  
Type: integer (number of connections)  
Default value: 0 |
## Connection parameters

<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| Asynchronous Message Bus Client disable    | mid.disable_amb    | Disables the Asynchronous Message Bus (AMB) Client. When AMB is enabled, the MID Server uses a default polling interval of 40 seconds. When the AMB client is disabled, the default polling interval switches to 5 seconds. If you set a polling interval with the `mid.poll.time` parameter, the MID Server uses that value whether or not the AMB client is enabled.  
  - Type: true | false  
  - Default value: false |
| Instance date format                       | instance.date.format | Specifies the format the instance uses for dates and times. The primary impact of setting this parameter is to allow the MID Server to correctly refresh its start and stop times on the MID Server record in ServiceNow. The format of this date/time string is identical to that used by the Java SimpleDateFormat class.  
  - Type: string (Date format)  
  - Default value: yyyy-MM-dd HH:mm:ss |
| MID Server immediate response enable       | glide.mid.fast.responses | Instructs the MID Server to try sending messages to the instance as soon as they are ready. Normally the MID Servers ends message to the ServiceNow instance serially (that is, one message at a time). Since many probes can be run in parallel, there can be multiple messages simultaneously transmitted to the instance. Setting this parameter to true may decrease the time between a probe's completion and its response arriving at the instance. However, the multiple simultaneous messages consume resources, decreasing the overall instance responsiveness. If there are communications problems, this parameter's value can also cause a logjam on the MID Server, as threads normally used for running probes may be consumed for sending messages. Generally, leave this parameter out of your configuration. Setting it to true is meaningful only under very special circumstances.  
  - Type: true | false  
  - Default value: false |
<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| MID Server JMX enable | mid.jmx.enabled | Enables a JMX server on the MID Server, which exposes some management information to JMX consoles. Implementing JMX requires additional configuration of the Java runtime environment. Setting this parameter to true is only recommended for those with detailed knowledge of the Java security architecture and a specific need for JMX.  
  - Type: true | false  
  - Default value: false |
| MID Server max transmission queue size | glide.mid.max.sender.queue.size | Places an upper limit on how large the queue is allowed to get. The MID Server starts deleting queued messages if this limit is exceeded. When the MID Server generates messages to the ServiceNow instance faster than it can send them, it queues them temporarily on the file system of the MID Server’s host. This queue is normally quite small, and is completely emptied as soon as the MID Server processing slows for a short period. However, this queue can grow in size when there are communication problems between the MID Server and the instance, and especially if there is an integration running on the MID Server.  
  - The parameter is of the form \{number\}{multiplier}, where \{number\} is any positive decimal number including non-integers, and the optional multiplier is any spelling of bytes, kilobytes, megabytes, gigabytes, or terabytes (only the first character is tested, and the test is case-insensitive). The default multiplier is bytes.  
  - White space is liberally tolerated. The following strings all represent valid parameters: "1000000000", "0.5m", "5 GB", "7.67gigas", "145.69392 meg", and "1.1 terra".  
  - Type: string  
  - Default value: 0.5 GB |
| MID Server maximum number of probe threads | threads.max | Controls the number of execution threads (simultaneous work) that probes may use. This parameter provides direct control over what CPU resources the MID Server consumes on the computer that hosts it. To decrease the MID Server’s CPU consumption, lower the number of threads. To make the MID Server work faster, increase the number of threads. See Set MID Server Thread Use.  
  - Type: integer (threads)  
  - Default value: 25 |
| Maximum amount of interactive messages to queue in memory for processing. | threads.interactive.max | Sets the maximum amount of interactive messages to queue in memory for processing.  
  - Type: integer (threads)  
  - Default value: 4 |
<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| Maximum amount of expedited messages to queue in memory for processing. | threads.expedited.max         | Sets the maximum amount of expedited messages to queue in memory for processing.  
- Type: integer (threads)  
- Default value: 4 (threads) |
| MID Server poll time in seconds when MID server is not busy. | mid.poll.time                  | Sets the default MID Server polling interval (in seconds). The polling interval is the amount of time the MID Server waits before checking the ECC queue for work when the ECC queue is not busy. The MID Server polls the ECC queue using this interval if the AMB client connection is dropped.  
**Note:** The default polling interval resets to 5 seconds when the AMB client is disabled. If you configure the mid.poll.time parameter, the MID Server uses this polling interval whether or not the AMB client is connected.  
- Type: integer (seconds)  
- Default value: 40 |

### Credentials parameters

<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| Credentials provider.                      | mid.credentials.provider | Specifies the Java class name of the credentials provider.  
- Type: string  
- Default value: com.service_now.mid.creds.standard.StandardCredentialsProvider |
| Class that the MID server uses to generate secure key pairs. | mid.secure_credentials.key_pairs.provider | Specifies the Java class name of the credentials provider.  
- Type: String  
- Default value: com.service_now.mid.keypairs.provider.standard.StandardKeyPairsProvider |
### Debug parameters

<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| Debug logging enable. | debug.logging | [Deprecated] Specifies whether to enable logging of MID Server events and messages (both sent and received). Normally this parameter is only used by developers, but it is occasionally useful when troubleshooting a problem. Be aware that setting this parameter to true causes intensive logging on the MID Server, potentially using considerable disk space.  
  - Type: True | False  
  - Default value: false  

This parameter has been replaced by the mid.log.level parameter.

| Debug mode enable. | debug | [Deprecated] Specifies whether to enable debug logging on the MID Server. Normally this parameter is only used by developers, but it is occasionally useful when troubleshooting a problem. Be aware that setting this parameter to true causes intensive logging on the MID Server, potentially using considerable disk space.  
  - Type: True | False  
  - Default value: false  

This parameter has been replaced by the mid.log.level parameter.

| Debug file probe templates. | file.probe.template.debug | Specifies whether to debug file probe templates.  
  - Type: True | False  
  - Default: false  

| Enables debug logging for CIM / WBEM / SLP / SMI-S. | mid.cim.debug | Specifies whether to enable debug logging for CIM, WBEM, SLP, or SMI-S.  
  - Type: True | False  
  - Default value: false |
<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| Enable debug logging for ServiceNow SSH Client.                      | mid.ssh.debug | Enables SSH debug information in the log file. The parameter usage depends on whether the ServiceNow SSH client is enabled.  
When the ServiceNow SSH client is enabled, the parameter functions as follows:  
• Type: String  
• Default value: false  
The following string values are valid for the ServiceNow SSH client:  
• true: Enables SSH debug information in the log file.  
• false: Disables SSH debug information in the log file.  
• <IP Addresses>: Specify which IP ranges to enable SSH debug information in the log file. You can enter IP addresses in the following formats:  
  • An IP range defined by a slash and the number of bits in the subnetwork. For example, the string 10.10.0.0/24 scans 24 bits of IP addresses from 10.10.0 to 10.10.254.  
  • An IP range defined by a dash. For example, the string 10.10.11.0-10.10.11.165 scans the IP addresses from 10.10.11.0 to 10.10.11.165.  
  • A comma-separated list of specific IP addresses. For example the string 10.10.11.200,10.10.11.235 scans the IP addresses 10.10.11.200 and 10.10.11.235.  
• deferred: Logs SSH debug information in memory unless an error or warning occurs. If an error or warning occurs, the platform publishes the debug information to the log file. This ensures that only the part of the log file pertaining to the error or warning is recorded. If no error or warning is detected, the platform deletes the unused log data from memory when the session closes. Each session stores up to 1000 log messages. If the session exceeds 1000 log messages, the deferred log discards the oldest log message to make room for the newest log message.  
When the ServiceNow SSH client is disabled, the parameter enables or disables SSH debug information in the log file:  
• Type: True | False  
• Default value: false |

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<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| MID Server logging level. | mid.log.level                 | Specifies the logging level for the MID Server. Possible values are: debug, info, warn, error  
|       |                               | **Note:** Values are case insensitive.                                                                                                         |
|       |                               | • Type: String  
|       |                               | • Default value: info  
| Enables debug logging for the Idle Connection Monitor. | mid.http.idle_connection_monitor.debug | Enables debug logging for the Idle Connection Monitor.  
|       |                               | • Type: True | False  
|       |                               | • Default value: false  

### DNS parameters

<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| DNS scanning regulator interval (ms) | mid.dns_scan.regulator.interval_ms | Specifies the interval between DNS scans in milliseconds.  
|       |                                                          | • Type: Integer  
|       |                                                          | • Default value: 10  
| DNS scanning regulator packets per interval | mid.dns_scan.regulator.packets_per_interval | Specifies the number of regulator packets per DNS scan.  
|       |                                                          | • Type: Integer  
|       |                                                          | • Default value: 1  
| DNS scanning default name servers | mid.dns_scan.default_name_servers | Specifies the host names or IP addresses of the default name servers.  
|       |                                                          | • Type: String  
|       |                                                          | • Default value: none  
| DNS scanning additional name servers | mid.dns_scan.additional_name_servers | Specifies the host names or IP addresses of any additional name servers.  
|       |                                                          | • Type: String  
|       |                                                          | • Default value: none  

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<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| DNS scanning load balancing enable | mid.dns_scan.load_balancing_enable | Specifies whether to enable load balancing of name servers.  
  - Type: True | False  
  - Default value: false |
| FTP connection parameters | | |
| Max size of the FTP Connection Pool | mid.ftp.max_pool_size | Specifies the maximum size of the FTP Connection Pool, in megabytes.  
  - Type: Integer  
  - Default value: 25 |
| Max number of the FTP connections per target | mid.ftp.max_per_target | Specifies the maximum number of the FTP connections per target.  
  - Type: Integer  
  - Default value: 5 |
| Max amount of time that an FTP connection can sit idle in the pool | mid.ftp.max_conn_idle_time | Specifies the maximum amount of time, in milliseconds, that an FTP connection can sit idle in the pool.  
  - Type: Integer  
  - Default value: 300000 |
| Max number of files that can be returned in the filesystem list directory command | mid.filesystem.max.ls | Specifies the maximum number of files that can be returned in the filesystem list directory command.  
  - Type: Integer  
  - Default value: 10000 |
| Logging parameters | | |
| Disable monitor checking | disable_monitors | Specifies whether to disable the MID Server from actively checking for monitors on the instance.  
  - Type: True | False  
  - Default value: false |
### Query logging enable

**Label:** Query logging enable  
**Names:** mid.show.queries

Instructs the MID Server whether to log details about every query it makes to the ServiceNow instance. Typically this parameter is only used by developers, but it is occasionally useful when troubleshooting a problem. Be aware that setting this parameter to true causes intensive logging on the MID Server, potentially using considerable disk space.

- **Type:** True | False
- **Default value:** false

### Remote logging disable

**Label:** Remote logging disable  
**Names:** disable.remote.logging

Prevents the MID Server from logging any information to the MID Server log on the instance. Relatively little information is logged on the instance in any case, but setting this parameter to true eliminates all logging on the instance.

- **Type:** True | False
- **Default value:** false

### Status sending disable

**Label:** Status sending disable  
**Names:** disable.status

Prevents the MID Server from sending a status report to the instance every 10 minutes.

- **Type:** True | False
- **Default value:** false

### Proxy server parameters

<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instance proxy enable</td>
<td>mid.instance.use_proxy or</td>
<td>If your MID Server must go through a web proxy to access the ServiceNow instance, set this parameter to true to instruct the MID Server to use the proxy. You must also set the proxy server's host and port, and perhaps the user name and password as well.</td>
</tr>
<tr>
<td></td>
<td>mid.proxy.use_proxy</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- <strong>Type:</strong> True</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- <strong>Default value:</strong> false</td>
</tr>
<tr>
<td>Instance proxy host</td>
<td>mid.proxy.host</td>
<td>If your MID Server must go through a web proxy to access the ServiceNow instance, set this parameter to define the proxy's host.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- <strong>Type:</strong> String</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- <strong>Default value:</strong> none</td>
</tr>
</tbody>
</table>
### London

<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instance proxy password</td>
<td>mid.proxy.password</td>
<td>If your MID Server must go through a web proxy to access the ServiceNow instance, and your proxy requires a password, set this parameter to define that password.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: String</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: none</td>
</tr>
<tr>
<td>Instance proxy port</td>
<td>mid.proxy.port</td>
<td>If your MID Server must go through a web proxy to access the ServiceNow instance, set this parameter to define the proxy's port.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: Integer (0-65535)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 80</td>
</tr>
<tr>
<td>Instance proxy user name</td>
<td>mid.proxy.username</td>
<td>If the MID Server must go through a web proxy to access the ServiceNow instance, and the proxy requires a user name, set this parameter to define that user name.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: String</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: none</td>
</tr>
</tbody>
</table>

### Shazzam parameters

<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port probe packet interval</td>
<td>mid.shazzam.regulator.interval_ms</td>
<td>Sets the interval, in milliseconds, in which Shazzam can launch packets. This parameter works with the mid.shazzam.regulator.packets_per_interval parameter to set the number of packets allowed in that interval. By default, Shazzam launches one packet each millisecond.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: Integer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 1</td>
</tr>
<tr>
<td>Port probe packets launched</td>
<td>mid.shazzam.regulator.packets_per_interval</td>
<td>Number of packets that Shazzam can launch in the configured time interval. This parameter works with the mid.shazzam.regulator.interval_ms parameter, which sets that interval. By default, Shazzam launches one packet each millisecond.</td>
</tr>
<tr>
<td>per regulator interval</td>
<td></td>
<td>• Type: Integer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 1</td>
</tr>
</tbody>
</table>
### London ServiceNow Now Platform Capabilities

<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shazzam chunk size</td>
<td>mid.shazzam.chunk_size</td>
<td>Specifies the maximum number of IP addresses that Shazzam scans in parallel. This parameter primarily controls outbound port consumption.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: Integer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 100</td>
</tr>
</tbody>
</table>

### SSH Discovery parameters

<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MID Server connection cache</td>
<td>mid.connection_cache</td>
<td>Specifies whether to cache connections. Set to false to disable connection caching. This parameter applies to SSH connections only.</td>
</tr>
<tr>
<td>Decide if the PATH environment variable should be set for SSH commands</td>
<td>mid.ssh.set_path</td>
<td>Specifies whether to set the PATH environment variable for SSH commands.</td>
</tr>
<tr>
<td>Process commands against localhost via SSH rather than console</td>
<td>mid.ssh.local</td>
<td>Specifies whether to execute commands for the MID Server host machine (localhost) via SSH rather than from a console. This allows long-running commands to execute properly. This parameter applies to the legacy SSH client only.</td>
</tr>
<tr>
<td>MID Server SSH connection per host</td>
<td>mid.ssh_connections_per_host</td>
<td>Controls the number of concurrent probes the MID Server can run against a given host. Lowering the number of concurrent connections can slow Discovery.</td>
</tr>
<tr>
<td>Enable (or disable) sudo to preserve environment (-E) for SSH</td>
<td>mid.ssh.sudo_preserve_environment</td>
<td>Specifies whether to use sudo to preserve the environment for SSH.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: false</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set the PATH environment paths for SSH commands</td>
<td>mid.ssh.path_override</td>
<td>Overrides the default paths set before executing a command. Enter one or more override paths delimited by a colon (:). The default path is /usr/sbin: /usr/bin: /bin: /sbin.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The ServiceNow SSH client accepts the following prefixes in front of the path_override value.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• append: Appends the override path to the end of the host’s path. This is the default behavior.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• replace: Replaces the host path with the path_override value.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• prepend: Appends the override path to the front of the host path.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: string (a colon-separated list of directories)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: None</td>
</tr>
<tr>
<td>Enable the ServiceNow SSH Client</td>
<td>mid.ssh.use_snc</td>
<td>Enables the ServiceNow SSH client (SNCSSH) on individual MID Servers. SNCSSH is a ServiceNow implementation of an SSH client and is active by default for all MID Servers on new instances, via a MID Server property. Enabling the ServiceNow SSH client disables the legacy J2SSH client.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Important: Mixing SSH client types for MID Servers connected to the same instance is not a good practice.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: false</td>
</tr>
<tr>
<td>The maximum number of times to retry an SSH operation after a timeout</td>
<td>mid.ssh.max_retries</td>
<td>Specifies the maximum amount of times to retry an SSH operation after a time-out. The system sleeps two seconds between each connection attempt. By default, the MID Server retries once only. Set the parameter to 0 to disable retries.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 1</td>
</tr>
<tr>
<td>Sets a different remove file command to replace the default '/bin/rm -f'</td>
<td>mid.ssh.alt_rm</td>
<td>Sets a different SSH remove file command.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: none</td>
</tr>
<tr>
<td>Delay sending any SSH commands to a server after connecting</td>
<td>mid.ssh.initial_delay_ms</td>
<td>Delays sending any SSH probe commands to a server after connecting to the target for the time specified in milliseconds. This parameter applies to the legacy SSH client only.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: integer (milliseconds)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 0</td>
</tr>
<tr>
<td>Label</td>
<td>Names</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------------------------------</td>
<td>--------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Suppress history file generation for SSH               | mid.ssh.suppress_history                  | Suppresses the generation of the SSH history file. This parameter applies to the legacy SSH client only.  
  - Type: true | false  
  - Default value: false                                                                             |
| Timeout in ms for SSH socket read                       | mid.ssh.socket_timeout                    | Specifies the timeout value for the SSH socket to prevent issues created by a socket timeout. Some devices, such as systems with embedded controllers like UPSs and PDUs, that have SSH enabled require more time to respond to an authentication request. The default value of 2 minutes ensures such requests do not timeout prematurely.  
  - Type: integer (milliseconds)  
  - Default value: 120000 (2 minutes)                                                                   |
| Timeout in ms for SSH channel activity                 | mid.ssh.channel_timeout                   | Specifies the amount of time that the MID Server waits for activity on the SSH socket before closing the connection. If there has been no activity on the SSH socket for the specified timeout value, the MID Server closes the connection. Some devices, such as systems with embedded controllers like UPSs and PDUs, that have SSH enabled may require more time to respond to an authentication request.  
  - Type: integer (milliseconds)  
  - Default value: 120000 (2 minutes)                                                                   |
| Timeout in ms for SSH socket read                       | mid.ssh.session_timeout                   | Specifies the amount of time that a cached session remains in memory after last use. Excessively small values tend to decrease performance. This parameter applies to the ServiceNow SSH client only.  
  - Type: integer (milliseconds)  
  - Default value: 300000 (5 minutes)                                                                    |
| Timeout for SSH command execution (ms)                 | mid.ssh.command_timeout_ms                | The timeout duration, in milliseconds, for the execution of an SSH command.  
  - Type: integer (milliseconds)  
  - Default value: 300000 (5 minutes)                                                                    |
<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| Use keyboard interactive authentication for SSH | mid.ssh.use_keyboard_interactive | Uses the keyboard interactive authentication mode on SSH daemons on which it is activated.  
  - Type: true | false  
  - Default value: false  
  **Caution:** An issue exists in Mac OS X Sierra and later with the authentication order of the password and keyboard-interactive modes that can cause Discovery to fail. For details about this issue and the configuration required for proper SSH authentication, see KB0623600. |
| Min size of DH group in bits | mid.ssh.dh_group_length_min | Specifies the minimum group length in bits used for generating a "shared secret" key in Diffie-Hillman key exchange. The larger the key the more secure the SSH connection is but at the cost of performance.  
  - Type: integer (bits)  
  - Default value: 1024 |
| Max size of DH group in bits | mid.ssh.dh_group_length_max | Specifies the maximum group length in bits used for generating a "shared secret" key in Diffie-Hillman key exchange. The larger the key the more secure the SSH connection is but at the cost of performance.  
  - Type: integer (bits)  
  - Default value: 2048 |
| List of bourne-compatible shells | mid.ssh.shells_supported | Defines the bourne-compatible shells supported by MID Server. This value is a comma-separated list of supported shells, such as ksh, dsh, bash and sh.  
  - Type: string  
  - Default value: ksh,bash,sh |
| Discard long running command error output, emulating legacy behavior. | mid.ssh.discard_lrc_error | Discard long running command error output, emulating legacy behavior.  
  - Type: String  
  - Default value: j2ssh - true, sncssh - false |
| Ratio of ssh session pool capacity to mid thread number in percentage. | mid.ssh.pool_thread_ratio | Ratio of the SSH session pool capacity to the configured MID Server thread number (threads.max), expressed as a percentage. The number of permitted pool capacity sessions is set in this parameter. Regardless of the value set in this parameter, the system never permits the pool capacity to fall below 25 sessions.  
  - Type: Integer  
  - Default value: 150 |
### Disable the privilege check for SSHCommand.

**Label:** Disable the privilege check for SSHCommand.

**Names:** mid.ssh.disable_privilege_check

**Description:**
When this parameter is set to true, the Mid Server assumes that the user configured in the credential has the privilege to run the given command. For example, if you configure a Mid Server to use sudo, the Mid Server will assume that discovery user can run any command with “sudo”. The Mid Server still validates that sudo commands can be run on the target.

- **Type:** true | false
- **Default value:** false

By default, the MID Server is configured to search for SSH commands in the following paths and the logged-on user’s default paths:

- /usr/sbin
- /usr/bin
- /bin
- /sbin

### Upgrade parameters

#### Fixed MID Server version

**Label:** Fixed MID Server version

**Names:** mid.pinned.version

**Description:** Name of the version to which this MID Server is pinned.

- **Type:** string
- **Default value:** MID buildstamp

**Note:** To see the MID buildstamp for your instance, type stats.do in the navigation filter. An example of the buildstamp format is 04-29-2018_1930.

#### Upgrade proxy enable

**Label:** Upgrade proxy enable

**Names:** mid.upgrade.use_proxy

**Description:** If your MID Server must go through a web proxy to access the upgrade URL, set this parameter to true to instruct the MID Server to use the proxy. You must also set the proxy server’s host and port. If the instance proxy user name and password are set, they are used for the upgrade proxy as well.

- **Type:** true | false
- **Default value:** false

#### Upgrade proxy host

**Label:** Upgrade proxy host

**Names:** glide.mid.autoupgrade.proxy_host or glide.glidesoap.proxy_host

**Description:** If your MID Server must go through a web proxy to access the upgrade URL, define the proxy’s host here.

- **Type:** string (URL)
- **Default value:** none
## Upgrade proxy port

<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| Upgrade proxy port  | glide.mid.autoupgrade.proxy_port or glide.glidesoap.proxy_port | If your MID Server must go through a web proxy to access the upgrade URL, define the proxy's port here.  
  - Type: integer (0-65535)  
  - Default value: 80 |

## Upgrade proxy user

<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| Upgrade proxy user  | glide.mid.autoupgrade.proxy_user            | If your MID Server must go through a web proxy to access the upgrade URL, define the proxy's user name here.  
  - Type: string (URL)  
  - Default value: none |

## Upgrade proxy password

<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| Upgrade proxy password | glide.mid.autoupgrade.proxy_password         | If your MID Server must go through a web proxy to access the upgrade URL, define the proxy's password here.  
  - Type: string  
  - Default value: none |

### Windows Discovery parameters

<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| Maximum number of sessions allowed in the session pool. | mid.powershell_api.session_pool_max_size | Specifies the maximum number of sessions allowed in the session pool.  
  **Note:** Setting or changing this parameter requires restarting the MID Server.  
  - Type: Integer  
  - Default value: 25 |

| Maximum number of sessions allowed in the pool per target. | mid.powershell_api.session_pool_target_max_size | Specifies the maximum number of sessions allowed in the pool per target host.  
  **Note:** Setting or changing this parameter requires restarting the MID Server.  
  - Type: Integer  
  - Default value: 2 |

| Enables MID Server to use PowerShell Remoting | mid.sa.prefer_powershell | Enables MID Server to use PowerShell Remoting.  
  - Type: True | False  
  - Default value: false |
<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| Idle PowerShell session timeout (seconds). | mid.powershell_api.idle_session_timeout | Specifies the timeout value of idle PowerShell sessions in seconds.  
**Note:** Setting or changing this parameter requires restarting the MID Server.  
- Type: Integer  
- Default value: 60 |
| Sets the WinRM https port | mid.powershell_api_winrm.remote_https_port | Sets the WinRM https port for connecting to Windows servers using PowerShell over HTTPS.  
- Type: Integer  
- Default value: 5986 |
| Set the port WinRM will use to connect to remote hosts | mid.powershell_api_winrm.remote_port | Configures the port for connecting to Windows servers using PowerShell over HTTP.  
- Type: Integer  
- Default value: 5985 |
| Skip SSL certificate check with WinRM | mid.powershell_api_winrm.skip_ssl_cert_check | Skips the SSL certificate check when using WinRM for HTTPS connections.  
- Type: True | False  
- Default value: false |
| Options used to skip SSL certificate check with WinRM | mid.powershell_api_winrm.skip_ssl_cert_check_options | Skips specific SSL certificate checks when using WinRM for HTTPS connections. Configure the MID Server to skip checks for certificates from a Certification Authority (CA), from the Common Name (CN) that identifies the host associated with the certificate, and for revoked certificates.  
- Type: String  
- Default value: -SkipCACheck -SkipCNCheck -SkipRevocationCheck |
| Requires the use of SSL certificates for HTTPS connections using WinRM | mid.powershell_api_winrm.use_ssl | Requires the use of SSL certificates for HTTPS connections using WinRM.  
- Type: True | False  
- Default value: false |
<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| Enable or disable PowerShell parameter passing via the command line. | mid.powershell.command.parameter_passing | Enable this parameter to allow passing PowerShell parameters from the command line.  
  - Type: True | False  
  - Default value: false |
| Enable or disable the PowerShell script parameter passing via the command line. | mid.powershell.command.script.parameter_passing | Enable this parameter to allow passing PowerShell scripts from the command line.  
  - Type: True | False  
  - Default value: true |
| Enable or Disable the enforcement of UTF-8 for command output | mid.powershell.enforce_utf8 | Enable this parameter to force commands on a target Windows system to return UTF-8 encoded output. Disabling it allows the target system to use its default encoding. This parameter is only valid when PowerShell is enabled.  
  Setting this value to false may result in incorrect values in the CMDB when non-ASCII characters are returned by a probe.  
  - Type: true | false  
  - Default value: true |
| Enable/Disable automatically falling back to the MID Server service user credential if all other credentials fail. | mid.powershell.local_mid_service_credential_fallback | Specifies the login credentials the MID Server uses if all other credentials fail.  
  - Type: True | False  
  - Default value: false |
<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| PowerShell executable path    | mid.powershell.path       | Enables an administrator to point to a specific PowerShell on a MID Server in cases where more than one PowerShell is installed. Supply the path to the folder containing the PowerShell executable, for example, C:\mypowershell or C:\mypowershell\. ServiceNow automatically appends the string powershell.exe to the path. Configure this parameter when both a 32-bit and 64-bit PowerShells are active on the same MID Server, and it becomes necessary to launch the correct PowerShell for the context. 64-bit Windows employs file system redirection and the MID Server runs as a 32-bit application. If trying to specify a path in %WinDir%\System32, Windows automatically redirects to %WinDir%\SysWOW64. To avoid redirection, specify the path as %WinDir%\Sysnative. For example, instead of C:\WINDOWS\system32\WindowsPowerShell\v1.0, specify C:\WINDOWS\sysnative\WindowsPowerShell\v1.0.  

**Note:** On a 64-bit version of Windows Server 2003 or Windows XP, a Microsoft hotfix may be required to enable this.

To discover applications running on a 64-bit Windows machine, the MID Server must be running on a 64-bit Windows host machine.

- Type: string (path)  
- Default value: none  

| PowerShell credentials        | mid.powershell.use_credentials | Determines the credentials to use for Discovery with PowerShell. A setting of true directs the MID Server to run probes with the Windows credentials from the credentials table. To run probes with the credentials of the user for the MID Server service, set this parameter to false.  

- Type: true | false  
- Default value: true  

| Enable PowerShell for Discovery | mid.use_powershell | Enables or disables PowerShell for Discovery. Restart the MID Server after changing the value. If PowerShell is not installed or the version installed is less than version 2.0, Discovery reverts to using WMIRunner.  

- Type: true | false  
- Default value: true, in the Fuji release.  
- Default value: false, in releases prior to Fuji.  

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### London ServiceNow Now Platform Capabilities

<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| Set the protocol MID Servers use to communicate with remote Windows hosts. | mid.windows.management_protocol | Enables administrators to select the Windows management protocol used for device and process classification. Options include:  
• WMI  
• WinRM  
• Type: String  
• Default value: WMI |
| Timeout for all Windows probes on a MID Server. | mid.windows.probe_timeout | Sets the timeout interval for all Windows probes on a specific MID Server. This value is overridden by the values configured for individual probes with the wmi_timeout probe parameter.  
• Type: Integer  
• Default value: 300 |

### SNMP configuration parameters

<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| Enable automatic inclusion of SNMP public community string. | mid.snmp.enable_auto_public | Specifies whether to use the SNMP public community string automatically if no other SNMP credentials were successful.  
• Type: True | False  
• Default value: true |
| Maximum time to wait for a response for the first OID request. | mid.snmp.request.timeout | Specifies the timeout value for the first OID request in milliseconds. For subsequent requests (for example, table OIDs), the mid.snmp.session.timeout configuration parameter (see below) takes effect.  
**Note:** You can override this parameter with the timeout SNMP probe parameter.  
• Type: Integer  
• Default value: 1500 |
<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| Maximum time to wait for responses to OID requests once a session has been established. | mid.snmp.session.timeout                   | Specifies the timeout value for subsequent OID request, in milliseconds. SNMP communication is stateless and does not have a session or connection in the normal sense. The system regards a positive response from the first OID request as a sign that it should expect prompt responses to subsequent requests. While the default is short, it may be useful to increase this parameter value to the same value that used for mid.snmp.request.timeout.  
  
  **Note:** You can override this parameter with the `establish_session_timeout` SNMP probe parameter.  
  
  - Type: Integer  
  - Default value: 500  

| Use the Snmp4j library for SNMP communication.                      | mid.snmp.use_snmp4j                       | Use the Snmp4j library for SNMP communication. This is a strict requirement for SNMPv3. This parameter should only be set to false based on advice from customer support.  
  
  - Type: True | False  
  - Default value: true  

| Use SNMP v1 and v2c for probes.                                    | mid.snmp.use_snmp_v1_v2c                  | Attempt communication using these SNMP protocol versions. Requires configuration of SNMP community string credentials or the mid.snmp.enable_auto_public parameter set to true, as applicable for targeted devices.  
  
  - Type: True | False  
  - Default value: true  

| Use SNMP v3 for probes.                                            | mid.snmp.use_snmp_v3                     | Attempt communication using the SNMPv3 protocol version. Requires configuration of SNMPv3 credentials.  
  
  - Type: True | False  
  - Default value: true  

**Table 605: Event Management parameters**

<table>
<thead>
<tr>
<th>Label</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| Bulk size for sending events | mid.probe.event.bulk_size          | Specifies the maximum size of an event payload, in MB.  
  
  - Type: Integer  
  - Default value: 120  

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<table>
<thead>
<tr>
<th>Label</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| Waiting period on empty queue for sending events                     | mid.probe.event.wait_time           | Waiting period on an empty queue for sending events.  
- Type: Integer  
- Default value: 1000                                                  |
| Enables or disables sending events.                                   | mid.probe.event.send.enabled        | Enables or disables the sending of events.  
- Type: True | False  
- Default value: true                                                  |
| Maximum size of events queue allowed before events will be rejected  | mid.probe.event.queue.max_size      | Specifies the maximum size permitted for the event queue before incoming events are rejected.  
- Type: Integer  
- Default value: 100,000                                                |
| If true then bulk of events will be sent to the server instead of single event sending | mid.probe.event.queue.use_bulk      | Specifies whether events are sent to the server singly or in bulk. If this parameter evaluates to true then events are sent to the server in bulk.  
- Type: True | False  
- Default value: true                                                  |
| Policy to prevent whitespace in event description field.             | mid.probe.event.suppress.whitespaces | Allows line breaks in description fields for multi-line events. Apply this parameter to each MID Server used with event connector instances. Choices are:  
- all  
- leave_as_is  
- keep_newline  
- Type: String  
- Default: all                                                             |
| Limit of number of active metrics to CI mappings                     | mid.em.metric.metric_to_ci_map_limit | Specifies the maximum number of active metrics allowed per CI map.  
- Type:  
- Default value: 200,000                                                |
| Number of seconds to wait before resending unhandled event           | mid.em.metric_binding_timeout       | Specifies the number of seconds to wait before resending unhandled events  
- Type: Integer  
- Default value: 300                                                      |
| Max number of seconds to wait before resending unhandled event       | mid.em.metric_binding_timeout       | Specifies the maximum number of seconds to wait before resending unhandled events.  
- Type: Integer  
- Default value: 10800                                                  |
<table>
<thead>
<tr>
<th>Label</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| Max number of seconds before refreshing the metric source type cache in memory | mid.em.metric_max_elapsed_time_before_refresh | Specifies the maximum number of seconds before the metric source type cache is refreshed in memory.  
  - Type: Integer  
  - Default value: 60 |
| Max length of string used for SQL command                           | mid.em.metric_max_sql_string_length_for_types | Specifies the maximum length of the string (composed of types) used for an SQL command  
  - Type: Integer  
  - Default value: 30000 |
| Period, in seconds, between statistics reports to the instance.      | mid.em.statistics_report_period  | Specifies the period, in seconds, between statistics reports to the instance. Use 0 to disable reporting. This parameter requires a restart.  
  - Type: Integer  
  - Default value: 60 |
| Max number of seconds to collect metrics in every cycle             | mid.em.metric_connector_max_run_time_seconds  | Specifies the maximum number of seconds to collect metrics in every cycle.  
  - Type: Integer  
  - Default value: 300 |
| Number of minutes to go back in history to retrieve metrics         | mid.em.metric_connector_history_min | Specifies the number of minutes to go back in history to retrieve metrics.  
  - Type: Integer  
  - Default value: 180 |
| Metric/Event Log Level                                              | mid.em.metric_event_logging | Specifies the level of metric and event logging. Choices are:  
  - none  
  - all  
  - events  
  - metrics  
  - metrics:<filter>  
  - events:<filter>  
  - Type: String  
  - Default value: none |
| Number of seconds of delay when collecting metrics                  | mid.em.metric_connector_late_arrivals_delay | Specifies the number of seconds to delay when collecting metrics.  
  - Type: Integer  
  - Default value: 30 |
Add a MID Server parameter

Use a MID Server parameter to control the behavior of a particular MID Server.

Role required: admin

1. Navigate to MID Server Servers.
2. From the list of MID Servers, select a MID Server to configure.
3. Select the Configuration Parameters related list.

This related list shows all the parameters currently in the MID Server 's configuration file. If there are any passwords, they are displayed in asterisks for security reasons.
4. To add parameters, click New, and then complete the form. After the form is submitted, the configuration file for that MID Server is modified to include the new parameter. Changes to existing parameters are reflected in the MID Server configuration file as well. Changes made to the MID Server configuration file do not take place immediately, but rather the next time the MID Server is restarted. The MID Server form has a related link for restarting the MID Server.

**Note:** ServiceNow prevents you from saving changes, such as modifying or deleting parameters, that would cause the MID Server to lose communications with the instance. For
example, you cannot change the url parameter. Any changes to these protected properties must be made directly in the config.xml file for that MID Server.

Setting Parameters from the config.xml File

MID Server configuration is controlled by an XML file called config.xml. This file is located in the \agent directory, immediately under the directory where the MID Server is installed. Edit this file directly to make any configuration changes to protected parameters. Many configuration changes, such as those that do not disrupt communication between the MID Server and the ServiceNow instance, may also be made from the instance.

The structure of the config.xml file is simply an outer parameters tag and a series of inner parameter tags. Each parameter tag has name and value attributes.

• To change the value of a parameter, edit the value attribute.
• To add a parameter, add another parameter tag with its name and value.
• To delete a parameter, delete the entire parameter tag.

The order of the parameters within the file is not important. Notice the green comment sections in the sample. Use these elements to add useful comments to the configuration file.

Note: When configuring the MID Server for use with a proxy server, be sure to remove the comment tags around the proxy sections that you configure.
Figure 322: MID Server config.xml file

**Note:** The sample file here is from a Firefox browser. Conventional text editors, such as Notepad, WordPad, or TextEdit, do not display colors and variable fonts.

### MID Server pause

The MID server can be put into a Paused state to temporarily prevent it from polling the ECC Queue for work or sending Discovery results back to the instance.

You might want to pause the MID Server when your network infrastructure is undergoing changes. This prevents applications like Discovery from throwing errors during a particular maintenance window.

A paused MID Server continues processing commands that it had already retrieved before it was paused. When you resume the MID Server, the MID Server starts retrieving new commands to process.
Note: Discovery continues to assign jobs to MID Servers that are Paused. MID Servers that are Down are not assigned jobs.

Unlike stopping the MID Server from the Windows or Linux server command line on the MID Server machine, pausing the MID server is something that you can do from the instance. The MID Server pause feature is available starting with the Istanbul release.

Note: You can only pause validated MID Servers.

You can still perform these actions when the MID Server is paused:

- Access the MID Server logs and delete log entries.
- View MID server statistics. While the MID Server is in the Paused state it stops generating statistics. But you can still view the statistics generated before you paused the MID Server.
- Retrieve the MID Server thread dump.
- Make and save configuration changes and property changes to the server. The changes take effect after the MID Server is resumed.
- Clear the ECC queue.

The MID server heartbeat continues to function while the MID Server is in the Paused state. If the MID Server is upgraded while it is in the Paused state, the MID Server state automatically changes to Up after successful upgrade. It does not return to the Paused state.

During MID Server selection, paused MID Server can still be selected but are prioritized below MID Servers that are not paused.

Events that occur during MID Server pause

The vCenter and SNMP event collectors, continue to run and process events when you pause the MID Server. These events are not part of the normal synchronous communication that the MID Server has with the instance that you see in the ECC queue. Events are still relayed to the instance and can even trigger actions on records in the instance, such as a CI update. For example, if vCenter detects that a virtual machine goes down or is deleted, a vCenter event makes a change to the status of the corresponding CI record for that virtual machine.

To prevent these events from being processed, stop the extensions from running. See:

- Configure and run the vCenter event collector extension
- Configure the SNMP Trap Collector Extension

Pause the MID Server

Pause the MID Server to temporarily prevent it from polling the ECC Queue for work or sending Discovery results back to the instance.

Role required: agent_admin

You can only pause validated MID Servers.

1. Open the MID server record.
2. Select a running MID Server that has been validated.
3. On the MID Server form, select Pause MID under Related Links.
   The state of the MID Server changes to Paused.
4. To resume MID Server processing, select Resume MID under Related Links.

**MID Server domain separation**

MID Servers can be configured in separate domains.

The records that can be read, updated, or created by a MID Server are determined by the credentials configured for that MID Server in the config.xml file. These are the user credentials that a MID Server uses to access the instance and specify which domain's records that MID Server can access.

You can create versions of these specific MID Server policy records that only a MID Server from the same domain can use. This process separation is supported for records in tables that extend MID Server Synchronized Files [ecc_agent_sync_file]:

- MID Server MIB File [ecc_agent_mib]
- MID Server JAR File [ecc_agent_jar]
- MID Server Script File [ecc_agent_script_files]

See [Set up domain separation for MID servers](#) on page 1677 for instructions on setting up domain separation through the MID server.

**Note:** Attachments on MIB or JAR file records might not appear as they did in a non-domain separated environment. The attachments do not appear because the Attachments [sys_attachment] table is data separated. When data is separated between domains, a record in a child domain cannot access records in a parent domain.

### Set up domain separation for MID servers

Set up domain separation through the MID server user role and the MID Server configuration file.

Role required: admin, agent_admin

1. **Configure a MID Server user** within a specified domain with the proper mid_server role.

2. Specify this user within the MID Server config.xml file. When you set the **MID Server user credentials** in the config.xml file, make sure they are in the proper domain.

If you must change the MID Server domain:

1. Stop the MID Server and delete the ecc_agent record.

2. Update the MID Server config.xml with the new user in the new domain and restart the MID Server service.

If you need to create versions of specific MID Server files that only MID Servers in your domain can use:

1. Open or create a record in one of these MID Server modules:
• SNMP MIBs
• JAR Files
• Script Files

2. Update an existing domain policy or submit a new record.

   **Note:** Attachments on MIB or JAR file records might not appear as they did in a non-domain separated environment. The attachments do not appear because the Attachments [sys_attachment] table is data separated. When data is separated between domains, a record in a child domain cannot access records in a parent domain.

Configure a multi-domain MID Server

You can create a MID Server in the global domain that can explore targets in other domains.

Before configuring a multi-domain MID Server:

- Ensure that your instance is *domain separated*.

Role required: admin

1. Type sys_properties.list in the navigation filter and press Enter.
2. Locate the glide.ecc.enable_multidomain_mid property.
3. Set the value of the property to true.

   **Note:** Enabling this property has no effect on existing MID Servers. MID Servers in a domain prior to setting this property, remain in that domain.

4. Create a MID Server in the global domain.

   A MID Server created in the global domain after this property is set to true can explore any domain for which it has the credentials. However, this MID Server is restricted to trying only the credentials for the target domains requested by ECC Queue inputs.

   **Caution:** If you reset the glide.ecc.enable_multidomain_mid property to false after creating a multi-domain MID Server in the global domain, that MID Server writes all the data it receives to the global domain and not to the correct domains.

MID Server privileged commands

To discover certain information on a host server, the MID Server must run SSH commands with higher privileges. The platform provides default privileged commands for the MID Server to use and the ability to add additional commands to the system.

An example of information that requires elevated privileges is information about storage disks on a host server, retrieved with the fdisk -l command. If your system cannot use sudo commands, you must configure the hosts in your network to use one of the other privileged commands. You can have different privileged commands set up for different hosts. However, Discovery supports only one privileged command per host.

   **Important:** You can edit supported privileged commands, but do not delete them.

For a list of possible SSH commands requiring root privileges, see *SSH credentials* on page 1045.
### Table 606: SSH privileged escalation command requirements

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
</table>
| sudo    | • Host must support the `sudo -S -p <password>` command and return the correct list of allowed SSH commands.  
• Credentials provided for Discovery must be able to run the command `sudo -S -p <password> <commands>`. |
| pbrun   | • Host must support the `pbrun -v` command and return the correct version of PowerBroker.  
• Credentials provided for Discovery must be able to run `pbrun <commands>`.  
• Discovery does not support any other `pbrun` options, such as a password prompt.  
• The instance must be able to reach the target host via SSH. |
| pfexec  | • Host must support the `pfexec id -a` command and return the correct ID.  
• Credentials provided for Discovery must be able to run `pfexec <commands>`.  
• Discovery does not support any other `pfexec` options, such as a password prompt. |
| dzdo    | • Host must support the command `–v dzdo` command and return the path to `dzdo` in standard output.  
• Credentials provided for Discovery must be able to run `dzdo <commands>`.  
• Discovery does not support any other `dzdo` options, but Discovery supports password authentication for `dzdo`. |

### Long-running commands with sudo

Configure J2SSH and ServiceNow SSH to prevent long running commands using sudo from failing when the MID Server disconnects.

ServiceNow SSH allows probes to run sudo against individual commands or an entire, long-running script. This is also supported for the `pbrun` and `pfexec` privileged commands.

#### Sudo for individual commands

You can run sudo against individual commands within a probe, but only if all the following sudoer configurations are performed on the target:

- The `!requiretty` option is required.
• Allow individual commands to be run by the user in the provided credential with NOPASSWD configured.
• The target specifies an individual sudo call in the command or referenced scripts. For example, set sudo as "sudo fdisk -l" or "$\{sudo:fdisk -l\}" rather than "must_sudo" for the entire script.

Note: Running sudo against individual commands with ServiceNow SSH produces detailed and useful entries in the sudo logs on the target computer.

Running sudo on an entire script

If any of the required sudoer configuration requirements for individual commands is not in place, Discovery applies sudo to the initial and complete probes, and does not execute sudo remotely inside the command. This condition can be forced by setting must_sudo on the probe and eliminating any sudo commands within the probe.

This approach prevents long running commands from failing when the probe disconnects, but cannot specify individual commands in the sudoers configuration.

Logging

The logs from ServiceNow SSH sudo activity run against an entire script show cryptic entries, such as /tmp/.run.aef13123fe124123, which prevent administrators from controlling permissible commands and knowing the exact command that was run. Sudo run against individual commands produces more detailed log entries, such as /sbin/fdisk –l.

Add a new privileged command for use by the MID Server

Add a new privileged command to the Privileged Command [privileged_command] table that is available to your MID Servers.

Role required: admin

Important: Do not delete any of the supported commands.

1. Navigate to MID Server Privileged Command and click New.
2. Complete these fields:
   • Command: The name of the privileged command.
   • Password Prompt: The password prompt displayed to the user for this privileged command, or a regular expression that matches this password prompt. If this field is empty, no password is required for this privileged command, and no prompt is displayed. SUDO commands do not require a password prompt.
3. Click Submit.

Configure the MID Server to use specific privileged commands

You can configure the MID Server to use specific commands in a defined order.

Role required: admin

1. Navigate to the list of MID Servers using one of the following paths:
   • MID Server Servers
   • Discovery MID Servers
• Orchestration MID Servers

2. Select the MID Server you want to configure.
3. Click the menu icon in the header bar and select View Advanced from the context menu.

4. In the Privileged Command related list, click Edit.
5. Select the command you want this MID Server to use and click Save.

The default order of privileged commands is 100, but you can change the order as necessary. The privileged command with the smallest order number is tried first.
Create a pbrun profile privileged command

You can create a special configuration for the pbrun privileged command that allows it to run as a profile.  

Role required: discovery_admin, admin

Of all the privileged commands, only the pbrun command can be configured to run as a profile, and only one of these special pbrun configurations can function on a MID Server.

**Important:** Edit the existing pbrun record for this purpose. The system ignores any additional commands you create for pbrun.

1. Navigate to MID Server Privileged Command.
2. Select pbrun from the list.
3. In the Privileged Command record, edit the value in the Command field to use the format pbrun -u <profile>.
   For example, you can set pbrun -u admin as a command to run with an admin profile.
4. Click Update.

Map an IP address to a DNS name

If the MID Server manages resources within defined IP ranges, all host servers must have their DNS names mapped to an IP address.

Role required: admin
The association of an IP address to a DNS name ensures that the appropriate MID Server is selected based on the IP Address range configuration. If this is not done, Orchestration reverts to the default MID Server.

If Discovery cannot discover the server and resolve the DNS name to an IP address, you must creating the mapping manually, using this procedure.

1. Enter cmdb_ci_dns_name.list in the navigation filter.
   A list of DNS names appears.
2. Check the list for your host server.
   If the server does not appear in the list, continue with this procedure.
3. Click New.
4. Enter the fully-qualified domain name (FQDN) of the host server in the Name field.
5. Right-click in the form header and select Save from the context menu.
6. In the IP Address related list, click New.
7. In the IP Address field, enter the IP address of your host server.
8. In the Nic field, select eth0 or your preferred network interface controller.
9. Leave the Netmask field blank.
10. Click Submit.

**MID Server security and encryption**

Several options are available for you to enhance security on MID Servers, including credential and encryption security, the authorization of SOAP requests, and the establishment of secure socket layer (SSL) connections.

**How MID Server encryption works**

The MID Server login credentials appear in the config.xml file in clear text by default, but you can encrypt them. While the username and password are initially set in a config.xml configuration file on the MID server, once the MID server retrieves the credentials, it can replace the clear-text password with an encrypted password. For the encryption of the local MID server service account, the password is encrypted using an AES128 encryption algorithm. The MID server also maintains an encryption key that is generated each time it starts and remains in memory and not on the hard disk. When credentials need to be sent from the instance to the MID server, the following process takes place:

1. The instance retrieves the encrypted password and the unencrypted username from the instance database table.
2. The instance decrypts the encrypted password, and then re-encrypts it using the MID server encryption key.
3. The username and re-encrypted password are sent to the MID Server through the encrypted TLS session was already established between the MID server and the instance.
4. The MID server receives the credentials and decrypts the password in memory before using the credentials for remote operations. At no point is the credential password stored on the disk in an unencrypted format.

To enable this encryption, see *Encrypt MID Server login credentials* on page 1684.
MID Server encryption keypairs

Automation credentials are secured by encrypting them in the instance with the MID Server’s trusted public key prior to transmission. When the MID Server is created, it generates a keypair, consisting of a public and private key. After the MID Server is validated, it can use the private key to decrypt automation credentials. You should occasionally rekey the MID Server to meet your organization's security requirements. See Rekey a MID Server on page 1693 for instructions.

SSL certificates

You can add certificates to the MID Server if you want communication to occur over SSL. You can add these certificates to the cacerts keystore file:

- Signing Certificate Authority (CA) certificate
- MID Server certificate

See Add SSL certificates for the MID Server on page 1693 for instructions.

Note: The MID Server does not support SSL when importing data from an integration, such as an LDAP server.

Basic authentication credentials and SOAP requests

You can enforce basic authentication on each request. The MID Server is not able to communicate through a proxy server if the proxy server supports only NTLM authentication. You can use basic authentication with a proxy server or create an exception for the MID server host.

Supplying basic authentication information, regardless of whether it is required, has an added advantage. The web service invocation creates or updates data using the supplied credentials. For example, when you create an incident record, the journal fields have the user id of the basic authenticated user instead of the default Guest user. This behavior allows you to identify data added by a specific MID Server.

You can set basic authentication credentials for SOAP requests. See Require basic authorization for incoming SOAP requests on page 1693 for instructions. Each SOAP request contains an Authorization header as specified in the Basic Authentication protocol.

Note: The setting for enforcing strict security controls how the instance uses the credentials you provide for the MID Server. When the setting is enabled, you must provide a user ID with access to the tables the MID Server is trying to access. When the setting is disabled, any valid user ID allows the MID Server to access to all tables.

Encrypt MID Server login credentials

Encrypt the MID Server login credentials for added security.

Role required: admin

Any field in the config.xml file can be encrypted, but once encrypted, a field can be managed only from within the instance. You should encrypt password fields only for the MID Server and any proxy server specified.
Note: An encryption interface is available that enables you to move encryption out of the config.xml file entirely and into an external system.

1. Navigate to the agent directory that was created when the MID Server was installed and open the config.xml file using a text editor such as WordPad.

   The instance credentials section of the config.xml file looks like this:

   <!-- If your instance has authentication enabled (the normal case), set these parameters to define the user name and password the MID Server will use to log into the instance. -->

   <parameter name="mid.instance.username" value="midsrvadmin" />
   <parameter name="mid.instance.password" value="securepassw0rd" />

2. Add the encrypt="true" attribute to the password tag.

   <parameter name="mid.instance.username" value="midsrvadmin" />
   <parameter name="mid.instance.password" encrypt="true" value="securepassw0rd" />

3. Save the config.xml file, and then restart the MID Server service.

4. Open the config.xml file and view the encrypted password.

   <parameter name="mid.instance.username" value="midsrvadmin" />
   <parameter name="mid.instance.password" encrypt="true" value="encrypted:rhrfUNYRzZAI8/BkTtZmNA==" />

   The password cannot be decrypted, which means displaying it in clear text again, by changing the encryption attribute to false or by deleting the attribute. If the password is changed in the config.xml file and the MID Server restarted, the new password is encrypted.

ECC queue data encryption with the automation API

The automation API encrypts sensitive probe data that is sent from an instance to the MID Server through the ECC Queue.

You can use the automation API to encrypt data that you send from a custom application to the ECC queue and prevent that data from appearing in clear text. For example, you can encrypt a password used by a MID Server to authenticate on a REST endpoint.

Methods

The API provides these methods:

- encrypt()
- isEncrypted()

The following example shows how you might call these methods:

```javascript
var automation_api = new sn_automation.AutomationAPI();
var password = 'xyz';
var encrypted_password;
if (automation_api.isEncrypted(password))
    encrypted_password = password;
else
    encrypted_password = automation_api.encrypt(password);
```

The encrypted_password value can then be passed safely to the ECC Queue and on to the desired MID Server.
MID Server configuration file security

Sensitive MID Server configuration data can be protected using several different schemes, including internal and external data encryption and external data storage.

The MID Server provides the following built-in security options for content in the config.xml file:

- Default security provider: Secures the data in the config.xml file by encryption. When the MID Server is restarted, any unencrypted data is encrypted and written to the config.xml file. The default security provider offers these encryption options:
  - Default encryptor: Default process for encrypting data in the MID Server config.xml file. See Encrypt MID Server login credentials on page 1684 for details.
  - Windows Data Protection API (DPAPI): The operating system performs the data encryption, rather than the MID Server. DPAPI encryption is based on the logged in user's account. When this scheme is used, the data can only be decrypted by the same user account. If the account changes, the data must be re-encrypted.
  - Custom encryption: Implement the IMidServerEncrypter interface to create your own custom encryption scheme to manage sensitive config.xml data.

- CyberArk: Data security is provided by CyberArk's Privileged Account Security system, which moves sensitive data from the config.xml file to a secure CyberArk vault. This solution does not encrypt the data.

- Custom external storage: Implement the ISecuredConfigProvider interface to create your own custom external storage system to manage sensitive config.xml data.
Encrypt MID Server configuration data with DPAPI

Windows Data Protection API (DPAPI) encrypts sensitive data from the config.xml file, based on the MID Server user account.

Role required: admin

DPAPI encryption provides another level of security for data such as credentials, IP addresses, and URLs in the MID Server config.xml file. The operating system performs the data encryption, rather than the MID Server. DPAPI encryption is based on the logged in user's account. When this scheme is used, the data can only be decrypted by the same user account. If the account changes, the data must be re-encrypted.

1. Open the config.xml file in a text editor.
   This file is located in the /agent folder in your MID Server installation path.

2. Enable this parameter and value:
   ```xml
   <parameter name="mid.secure_encrypter" value="com.service_now.mid.services.config.WindowsDPAPIEncrypter"/>
   ```

3. Save the configuration file.
4. Restart the MID Server.
   Any values in clear text in the config.xml file are encrypted by the operating system.

5. Follow this procedure if you need to change the MID Server user account that is used for encryption.
   a) Stop the MID Server service.
   b) Open the config.xml file in a text editor.
      This file is located in the /agent folder in your MID Server installation path.
   c) Re-enter all the encrypted values in clear text.
   d) Make the changes to the MID Server user account in the ServiceNow® instance.
   e) Restart the MID Server service.
      The data is re-encrypted by the operating system, based the new MID Server user account.

Use CyberArk as a secure configuration provider
You can use a CyberArk vault to secure any sensitive data from the MID Server config.xml file.

Role required: admin
CyberArk is commonly used to secure credentials in its external vault. However, a MID Server parameter in the config.xml file enables you to store other types of data in CyberArk.

1. Open the config.xml file in a text editor.
   This file is located in the /agent folder in your MID Server installation path.
2. Enable this parameter and value:
   <parameter name="mid.secure_config.provider" value="com.service_now.mid.services.config.CyberArkSecuredConfigProvider"/>
3. Configure specific data to secure in the CyberArk vault, as shown in these examples.
   a) Secure the MID Server credentials by setting this parameter to match the ID and Type for that data in your CyberArk configuration.
      <parameter name="mid.instance.username" secure="true" value="cyberark:id=<CyberArk ID>, type=<CyberArk type>"/>
      <parameter name="mid.instance.password" secure="true" value="cyberark:id=<CyberArk ID>, type=<CyberArk type>"/>
   b) Secure the URL of the instance by setting this parameter to match the ID and Type for that data in your CyberArk configuration.
      <parameter name="url" secure="true" value="cyberark:id=<CyberArk ID>, type=<CyberArk type>"/>
4. Save the configuration file.
5. Restart the MID Server.

Change MID Server configuration file security schemes
The MID Server provides several schemes for securing sensitive data in the config.xml file and allows you to switch between these options to suit your security requirements.

Role required: admin
To switch between configuration security schemes:
1. Stop the MID Server service.
2. Open the config.xml file in a text editor.
   This file is located in the /agent folder in your MID Server installation path.
3. Re-enter all the encrypted values in clear text.
4. Disable the previous security scheme and configure the MID Server to use the new provider. 
5. Restart the MID Server service. 
   The data is re-secured or encrypted, based on the security scheme you have selected.

_MID Server ISecuredConfigProvider interface_
Use the methods in this interface to create custom providers that manage secured parameter values in the MID Server config.xml file.

**Note:** These methods are contained in the snc-automation-api.jar file, located in the MID Server installation folder.

### initialize

This method initializes the provider with additional configuration parameters and does not return a value.

**Table 607: Example**

```java
void initialize(java.util.Properties properties,
               IMidServerEncrypter encrypter)
throws java.lang.Exception
```

**Table 608: Parameters**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>properties</td>
<td>Initialization properties.</td>
</tr>
<tr>
<td>encrypter</td>
<td>Encrypter to use if the provider is encryption</td>
</tr>
<tr>
<td></td>
<td>based.</td>
</tr>
</tbody>
</table>

**Table 609: Exception**

```
java.lang.Exception
```

### isParameterValueSecured

This method checks to see if the parameter value has been secured or not. This method returns a boolean type value.

**Table 610: Example**

```java
boolean isParameterValueSecured(java.lang.String paramValue)
```
Table 611: Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>paramValue</td>
<td>The parameter value.</td>
</tr>
</tbody>
</table>

Table 612: Returns

The parameter returns true if the parameter value is secured.

**secureParameterValue**

This method secures the parameter value if it has not been secured. This method returns a string type value.

Table 613: Example

```java
java.lang.String secureParameterValue(java.lang.String unsecuredParameterValue) throws java.lang.Exception
```

Table 614: Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>unsecuredParameterValue</td>
<td>The unsecured parameter value.</td>
</tr>
</tbody>
</table>

Table 615: Returns

This method returns the unsecured parameter value.

Table 616: Exception

```java
java.lang.Exception
```

**unsecuredParameterValue**

This method returns the unsecured value of the parameter. This method returns a string type value.

Table 617: Example

```java
java.lang.String unsecuredParameterValue(java.lang.String parameterName) throws java.lang.Exception
```
Table 618: Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>parameterName</td>
<td>The parameter name.</td>
</tr>
</tbody>
</table>

Table 619: Returns

This parameter returns the unsecured value.

Table 620: Exception

java.lang.Exception

MID Server IMidServerEncrypter interface

Use the methods in this interface to create a custom external encrypter for the MID Server config.xml file.

Note: These methods are contained in the snc-automation-api.jar file, located in the MID Server installation folder.

initialize

This method initializes the encrypter with additional configuration parameters and does not return a value.

Table 621: Example

```java
void initialize(java.util.Properties properties)
    throws java.lang.Exception
```

Table 622: Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>properties</td>
<td>Initialization properties.</td>
</tr>
</tbody>
</table>

Table 623: Exception

java.lang.Exception

encrypt

This method encrypts the unencrypted data and returns a byte[] type value.
encrypt

Table 624: Example

```java
byte[] encrypt(byte[] unencryptedData)
throws java.lang.Exception
```

Table 625: Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>unencryptedData</td>
<td>The data unencrypted.</td>
</tr>
</tbody>
</table>

Table 626: Returns

Encrypted data

Table 627: Exception

java.lang.Exception

decrypt

This method decrypts encrypted data and returns a byte[ ] type value.

Table 628: Example

```java
byte[] decrypt(byte[] encryptedData)
throws java.lang.Exception
```

Table 629: Parameters

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>encryptedData</td>
<td>The data decrypted.</td>
</tr>
</tbody>
</table>

Table 630: Returns

Decrypted data.

Table 631: Exception

java.lang.Exception
Rekey a MID Server

Rekeying a MID Server forces it to restart and generate a new private key. Typically, this is only necessary if the MID Server keystore is compromised.

Role required: admin

When the MID Server comes back online, the system automatically validates the new key, and the MID Server resumes processing automation tasks.

1. Navigate to MID Server Servers.
2. Open the MID Server whose keypairs you want to rotate.

Add SSL certificates for the MID Server

Configure the MID Server to connect to a source over SSL.

Role required: admin

---

**Note:** The MID Server does not support SSL when importing data from an integration, such as an LDAP server.

1. Open a command prompt and navigate to the folder containing the JRE `keytool`. This is the location of the JRE you installed. An example path might be: C:\Program Files\Java\jre1.8.0_161\bin
2. Import a certificate into the MID Server's cacerts keystore, using this command:
   `keytool -import -alias <certificate alias> -file "<path to certificate>" -keystore "<path to the JRE>\lib\security\cacerts"
   
   For example, you might enter: `keytool -import -alias MyCA -file "C:\myca.cer" -keystore "C:\Program Files\Java\jre1.8.0_161\lib\security\cacerts"

   **Note:** The keytool prompts you for a certificate password. If the certificate is for a CA, the keytool also asks whether to trust the certificate authority. To add a certificate to an instance, see Upload a certificate to an instance.

---

Require basic authorization for incoming SOAP requests

For added security, you can enforce basic authentication on each incoming SOAP request to the MID Server.

Role required: admin

1. Navigate to System Properties Web Services.
2. Select the check box for Require basic authorization for incoming SOAP requests.
3. Click Save.
4. To provide basic authentication credentials for a MID Server, navigate to C:\Program Files\ServiceNow\<MID Server name>\agent and edit the config.xml file, as follows:
   a) Find the element `<parameter name="mid.instance.username" value=""/>` and enter the instance administrator user name as the value.
      For example, you might enter `<parameter name="mid.instance.username" value="admin"/>
   b) Find the element `<parameter name="mid.instance.password" value=""/>` and enter the configured password for this instance as the value.
For example, you might enter `<parameter name="mid.instance.password" value="abc123"/>`.

**Configure WinRM trusted hosts on MID Server**

In environments using Windows Remote Management (WinRM), Discovery or Service Mapping can discover servers using the WinRM protocol. Add servers, which are part of WinRM, as trusted hosts on all MID Servers that Discovery or Service Mapping use for discovery.

Role required: mid_admin

MID Server cannot access servers using the WinRM protocol unless these servers are configured as trusted hosts for this MID Server.

Perform this procedure on each MID Server used by Service Mapping or Discovery.

1. On the MID Server, open the command-line shell.
2. To add all servers to the TrustedHosts lists, run the following command:
   ```bash
   winrm s winrm/config/client @{TrustedHosts="*"}
   ```
3. To add specific servers to the TrustedHosts list, run the command with the comma-separated hosts instead of the asterisk (`*`), for example:
   ```bash
   winrm s winrm/config/client @{TrustedHosts="serverA,serverB,serverC"}
   ```

**Advanced MID Server configuration**

There are several advanced options available for you to customize and configure the MID Server.

**Install and uninstall Nmap on a MID Server**

If you decide to use *credential-less Discovery* in your network, you must install Nmap on each Windows MID Server that you want to use for this purpose. Self-hosted customers whose network security does not permit downloads from install.service-now.com must use a specific manual process to install and configure Nmap.

- Assign MID Server IP ranges to all deployed MID Servers. The quickest and most reliable way to do this is with the *MID Server IP range auto-assignment* on page 1640 feature available in the Discovery Quick Start wizard. This method ensures that the set of MID Servers configured to access an IP address range is comprehensive.
- Identify the IP ranges you want to explore with credential-less Discovery. Ensure that these ranges can only be accessed by MID Servers with Nmap installed, running on supported Windows hosts.
- Use the All option for selecting IP ranges and observe these requirements:
  - Restrict the use of this feature to Windows MID Servers only.
  - Ensure that Nmap is installed on each of these MID Servers.
  - Ensure that the MID Servers can access the entire customer network.
- When you create a Discovery schedule with Nmap enabled, observe these requirements for the MID Server selection options:
  - Specific MID Cluster: Verify that Nmap is installed on all MID Servers in the cluster, where each MID Server in the cluster is configured to access the same set of IP ranges.
  - Auto-Select Mid Server: When running horizontal Discovery, verify that Nmap is installed on at least one of the MID Servers that can access the Discovery schedule’s configured MID Server IP ranges.
• Specific MID Server: Verify that Nmap is installed on each MID Server that can access the schedule’s configured MID Server IP Ranges.

**Note:** To use credential-less Discovery for Service Mapping, install Nmap on all MID Servers that can access the Discovery schedule’s configured MID Server IP ranges.

• The Nmap installer download process has changed for new instances in the London release. Access to install.service-now.com is no longer required for the MID Server host machines on which Nmap is installed. When you request Nmap for a MID Server, the download is performed by the instance, not the MID Server host. This change does not require any additional configuration. Customer instances within a ServiceNow® datacenter have access to install.service-now.com automatically.

Role required: agent_admin

**Attention:** Self-hosted customers whose network security does not permit downloads from install.service-now.com must install and configure Nmap manually on their system. Refer to the procedure here for installing Nmap on a self-hosted system.

The Discovery - IP Based [com.snc.discovery.ip_based] plugin provides connection to the installer for Nmap and the programming elements that allow a Windows MID Server to run approved scripts on target CIs for credential-less Discovery. MID Servers on which Nmap is installed can execute an Nmap command configured to perform reverse DNS name resolution, discover MAC addresses, or gather OS information on target CIs without using credentials. The Discovery - IP Based plugin is activated automatically when the Discovery [com.snc.discovery] or Event Management and Service Mapping Core [com.snc.service-watch] plugins are activated.

**Important:** Service Mapping does not check for the presence of the Nmap capability and selects the MID Server based on the IP address only. To ensure that Service Mapping does not select a MID Server without the Nmap capability, install Nmap on all MID Servers assigned to the IP address ranges for which you want credential-less Discovery to be available. If Service Mapping selects a MID Server for credential-less Discovery that does not have Nmap capabilities, this error message appears in the map at the site of the CI being discovered: Nmap is not installed on MID Server. Verify all MIDs configured to handle selected IP Address have Nmap Capability. Nmap root directory path does not exist: <path>.

Nmap is supported on all editions of these operating systems, including virtual machines and 64 bit systems:
• Windows 2008
• Windows 2012
• Windows 2016

Nmap can be installed on MID Servers that meet these requirements:
• Status is Up.
• MID Server is validated.
• MID Server does not already have the Nmap capability.

**Important:** Running Nmap scans to or from any resource within the Amazon Web Service AWS environment is tightly regulated and requires the permission of AWS through the [AWS Vulnerability/Penetration Testing Request](https://aws.amazon.com/vulnerability-testing/) form. AWS only permits testing of EC2 and RDS instances that you own. Tests against any other AWS services or AWS-owned resources are prohibited. In addition, any Nmap scan of a permitted instance must be performed within an approved time window. For these reasons, credential-less Discovery within an AWS environment is not appropriate, and if a violation of their policy occurs, could result in expulsion from the service.
To install Nmap on a Windows MID Server:

1. Navigate to MID Server Servers.
2. Open the desired MID Server record.
3. Under Related Links, select Enable Credential-less Discovery.
   A confirmation dialog box appears.

4. Click Yes to continue with the installation.
   The instance runs the Nmap installer from https://install.service-now.com, a site within a ServiceNow datacenter that contains installers for the platform. This progress notice appears during installation:

   ![Enable Credential-less Discovery](image)

   The Logs tab in the MID Server record shows the message: Running system command: installNmap.

5. Click OK if you want to hide the dialog box while the installer continues to run in the background.
   Installing Nmap also installs Npcap on the host, if it is not already installed. Npcap is Nmap's packet capture library for Windows that allows Nmap to perform port scans quickly and to identify the family of the operating system running on the target. Npcap is installed once on the host and can be used by any other application that requires it, such as Wireshark.

   ![Enable Credential-less Discovery](image)

   **Note:** If a more recent version of Npcap is already installed on the Windows MID Server host, Nmap is installed without Npcap. If an older version of Npcap is installed on the host, the Nmap installer upgrades it to the newer version.

The installation process has either of these outcomes:

- **Success:** These conditions indicate a successful installation:
  - The version of Nmap that is installed appears in the Nmap version field in the MID Server record
• The Related Link changes to Disable Credential-less Discovery.
• The Nmap capability is assigned to the MID Server and appears in the Capabilities tab of the MID Server record.

• Failure: If the installation fails, an error message is logged to the MID Server Issue [ecc_agent_issue] table. If you run the installer again with success, the issue is marked as Resolved.

6. To uninstall Nmap for a selected MID Server, select Disable Credential-less Discovery under Related Links in the MID Server record.

This dialog appears during the uninstallation process:

![Disable Credential-less Discovery](image)

The Logs tab in the MID Server record shows the message: Running system command: uninstallNmap.

**Note:** Uninstalling Nmap does not uninstall Npcap. This must be done manually.

---

**Install Nmap on a self-hosted system**

Use this procedure to install Nmap on MID Server host machines in a self-hosted environment that does not allow network access to the ServiceNow® install.service-now.com download site.

**Role required:** admin, maint

You must install Nmap manually on each MID Server host, and then configure the instance to execute credential-less Discovery.

**Note:** This procedure does not apply to self-hosted customers whose instance can access install.service-now.com from within their network.

1. Navigate to MID Server Properties (MID Server Property [ecc_agent_property] table) and open the record for the mid.nmap.version property.

   This property contains the version of Nmap that you must install. Record the version number.

2. Download the correct installer executable from one of these URLs:

   • [https://nmap.org/dist](https://nmap.org/dist): If the Nmap version in the property is 7.50, the executable you need is [https://nmap.org/dist/nmap-7.50-setup.exe](https://nmap.org/dist/nmap-7.50-setup.exe).

3. Create a folder called nmap in the MID Server agent folder of every MID Server you want to use for credential-less Discovery.
4. Copy the Nmap installer file that you downloaded to the nmap folder and rename it to nmapInstaller.exe.

5. Run the agent\scripts\PowerShell\NmapInstallation.ps1 script and pass it the following parameters in the order in which they appear.
   This script runs the nmapInstaller.exe file.

   1. $operation: Task that NmapInstallations.ps1 will process. To install Nmap, the task is install.
   2. $nmap_root_path: Complete path for the nmap folder that you create in step 4.
   3. $nmap_self_installer: Complete path for nmapInstaller.exe file that you copied in step 5.
4. $nmap_command: Complete path for the Nmap install command. The NmapInstallations.ps1 script installs Nmap in the nmap folder created in step 4. This parameter is $nmap_root_path
\nmap.exe.

5. $nmap_uninstall_command: Complete path for the Nmap uninstall command. This command is $nmap_root_path\Uninstall.exe.

6. $nmap_npcap_version: The Npcap version installed with Nmap. This value must be the same as the value of the mid.nmap.npcap.version property in the MID Server Property [ecc_agent_property] table.

7. $nmap_safe_scripts: List of safe scripts that Nmap uses. You can retrieve this list from the mid.nmap.safe.scripts property in the MID Server Property [ecc_agent_property] table.

Set up the parameters in the NmapInstallation.ps1 script in this order:

`.\NmapInstallations.ps1 $operation $nmap_root_path $nmap_self_installer $nmap_command $nmap_uninstall_command $nmap_npcap_version $nmap_safe_scripts

For example, the script might look like this:

```
PS C:\MidServers\mid1\agent\scripts\PowerShell> .\NmapInstallation.ps1 "install"
"C:\MidServers\mid1\agent\nmap" "C:\MidServers\mid1\agent\nmap\nmapInstaller.exe"
"C:\MidServers\mid1\agent\nmap\nmap.exe"
"C:\MidServers\mid1\agent\nmap\Uninstall.exe" "0.91"
"allseeingeye-info.nse,amqp-info.nse,db2-das-info.nse,drda-info.nse,freelancer-info.nse,
ike-version.nse,mcafee-epo-agent.nse,mqtt-subscribe.nse,openlookup-info.nse,oracle-tns-version.nse,
quakel-info.nse,quake3-info.nse,rfc868-time.nse,rpcinfo.nse,snmp-info.nse,ventrilo-info.nse,
weblogic-t3-info.nse,xmpp-info.nse"
```

7. After installation is complete, add the Nmap capability to each MID Server you want to use for credential-less Discovery.

```
Attention: Only a maint user can add the Nmap capability to a MID Server. Contact ServiceNow customer support to request temporary maint access to your instance.
```

a) On the instance, open the MID Server record.
b) Select the Capabilities related list.
c) Click Edit.
d) Select Nmap from the list of available capabilities and click Save.
Uninstall Nmap on a self-hosted system

Use this procedure to uninstall Nmap in a self-hosted environment that does not allow network access to the ServiceNow install.service-now.com download site.

Role required: admin, maint

Nmap must be manually uninstalled from each MID Server host machine and then disabled on the ServiceNow instance.

1. Run Uninstall.exe in the nmap folder on each MID Server host configured for credential-less Discovery.
2. After uninstallation is complete, delete the nmap folder from the agent folder.
3. Remove the Nmap capability from each MID Server record.

**Attention:** Only a maint user can remove the Nmap capability from a MID Server. Contact ServiceNow customer support to request temporary maint access to your instance.

a) On the instance, open the MID Server record.

b) Select the Capabilities related list.

c) Click Edit.

d) Remove Nmap from the active capabilities list and click Save.

Enable script file synchronization for Windows enhanced security

Windows Internet Explorer enhanced security blocks downloaded files that it determines are potentially dangerous.

Enhanced security in Windows browsers, such as Internet Explorer, blocks downloaded files that it determines are potentially dangerous. This would block files downloaded for use by the MID Server. You would need to unblock each file manually through the browser.

To get around this issue, use file synchronization. File synchronization requires you to proactively take script files from your instance and save them on the MID Server. The files on the instance and the MID server stay synchronized, but there is no longer any need for the MID Server to download the whole file. File synchronization also protects any updates you make in those script files from being overwritten during the upgrade of an instance.
Script files synchronized with the MID Server are stored on the instance in the MID Server Script File [ecc_agent_script_file] table, which you can access in the MID Server Script Files module.

When the MID Server first connects to the instance, the instance creates a directory called \scripts in the MID Server root. The instance then creates a parent directory in the path \scripts\<parent name> using definitions from the ecc_agent_script_file table. Finally, the instance creates the script files themselves inside the parent directory using the records from the ecc_agent_script_file table.

The record for the parent directory looks like this:

![Parent Directory Record](image)

The instance creates each script file in the parent directory on the MID Server using the record Name from the ecc_agent_script_file table as the file name and the Script field payload as the file contents. A script file record looks like this:

![Script File Record](image)
The synchronization of the script file continues to work as if the script was manually added to the form. See *Attach a script file to a MID Server* on page 1702 for instructions on how to attach a script file.

**Note:** The MID Server Script File [ecc_agent_script_file] table is domain separated. You can create versions of these policies that only a MID Server from the same domain can use. For instructions, see *Set up domain separation for MID servers* on page 1677.

---

### Attach a script file to a MID Server

You can attach a script file to synchronize to a connected MID Server, to enable using the script file attachment.

**Role required:** admin

You can attach multiple files, but the last attached file gets synchronized to the MID Server. If you delete the attachment, the script file becomes inactive, and the synchronized file is deleted from MID Server.

1. Navigate to **MID Server Script Files**.
2. Open the file to which you would like to attach the script file, or click **New** to create a new file.
3. Select **Use attachment**, and then click the paperclip icon to add the attachment.
Note: When Use attachment is checked, an attached script file overrides the script contained in the Script field. If this check box is cleared, the script in the Script field is used instead of the attachment.

The script file attachment name must match the MID Server script file name, since the record can contain other attachments.

4. Click Update to initiate the synchronization process.
   Ensure that the file name matches the script name.

Note: If you receive the error message: File type not permitted or mime type does not match the file content, request that your administrator turn off mime type validation on attachments. The system property glide.security.file.mime_type.validation controls this setting.

Configure a MID Server for alert aggregation and RCA

To enable the Event Management alert aggregation and root cause analysis (RCA) capability, configure at least one dedicated MID Server with the ServiceAnalytics as a supported application, and with the RCA capability. To ensure uninterrupted services, it is recommended that you also configure a failover MID Server cluster for RCA.

If the Domain Support - Domain Extensions Installer plugin is activated, then you can configure a dedicated MID Server with the RCA capability, per domain. In this case, RCA for a business service is done on the MID Server that is in the same domain as the business service. Otherwise, a MID Server from the global domain is used.

Table 632: Hardware requirements

<table>
<thead>
<tr>
<th>Component</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memory</td>
<td>• Minimum: 4 GB</td>
</tr>
<tr>
<td></td>
<td>• Recommended: 8 GB</td>
</tr>
<tr>
<td>Processor</td>
<td>• Minimum: Either of the following:</td>
</tr>
<tr>
<td></td>
<td>• Core 2+</td>
</tr>
<tr>
<td></td>
<td>• Xeon processor with a speed over 2 GHz</td>
</tr>
<tr>
<td></td>
<td>• Recommended: Quad-core</td>
</tr>
<tr>
<td>Disk space (for 100 discovered services)</td>
<td>• Minimum: 8 GB</td>
</tr>
<tr>
<td></td>
<td>• Recommended: 10 GB</td>
</tr>
</tbody>
</table>
Table 633: Software requirements

<table>
<thead>
<tr>
<th>OS</th>
<th>Supported OS versions</th>
<th>Additional requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows</td>
<td>32-bit and 64-bit versions:</td>
<td>For either version of the OS:</td>
</tr>
<tr>
<td></td>
<td>• Windows 2008 R2</td>
<td>• 32-bit version of the MID Server</td>
</tr>
<tr>
<td></td>
<td>• Windows Server 2012 R2</td>
<td>• 32-bit version of Visual C++ Redistributable Packages for Visual Studio 2013, which</td>
</tr>
<tr>
<td>Linux</td>
<td>• Red Hat Enterprise Edition Linux 6.6 or later</td>
<td>32-bit or 64-bit version of the MID Server</td>
</tr>
<tr>
<td></td>
<td>• CentOS Linux 6.6 or later</td>
<td></td>
</tr>
</tbody>
</table>

Role required: admin

The RCA MID Server supports the Event Management RCA process by hosting the RCA Learner and the real-time RCA query handler. On the RCA MID Server, the system builds models that support responses to root cause queries. The learner data on the RCA MID Server persists by default for a maximum of 90 days.

By default, the MID Server is set up as a dedicated MID Server for Event Management RCA, and an attempt to add additional supported applications to the same MID Server is prevented. It is recommended that Operational Intelligence is also implemented with its own dedicated Operational Intelligence MID Server. These recommendations ensure high level of performance. However, if needed, you can modify this default behavior and configure the RCA MID Server or the Operational Intelligence MID Server with additional supported applications. For information about modifying the behavior of the ALL option when selecting supported applications, see Select applications to include in the definition of ALL for a MID Server on page 1637.

1. Ensure that the MID Server is validated.
   For more information, see Validate the MID Server on page 1611.
2. Navigate to MID Server Servers.
3. Double-click the MID Server that you want to configure as an RCA MID Server.
4. Add the ServiceAnalytics application:
   a) At the center of the MID Server form, click Supported Applications.
   b) In the Supported Applications section click Edit.
   c) In the slushbucket select ServiceAnalytics and click the > add button.
   d) click Save.

If the MID Server needs to support ServiceAnalytics as well as one or more other applications, you can modify the definition of the ALL option to include these applications, and then select ALL in the slushbucket. ALL is the only option to which it is valid to add the ServiceAnalytics option. Performance might be compromised with these settings.

5. Add the RCA capability:
   a) At the center of the MID Server form, click Capabilities.
   b) In the Capabilities section click Edit.
c) In the slushbucket select RCA and click the '>' add button.
d) click Save.

6. Click Update.

The RCA MID Server is automatically configured with a Discovery IP range set to 0.0.0.0-0.0.0.0.
Create a failover cluster for RCA. In this cluster, add the MID Servers that were configured for RCA. For more information, see Configure a MID Server cluster on page 1715.

MIDSystem methods

MIDSystem variables (referred to by the variable name ms.) provide a variety of methods to get information about the MID Server.

<table>
<thead>
<tr>
<th>Method summary</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>log(String message)</td>
<td>Logs the given message with a standard prefix to indicate that the message was generated by JavaScript.</td>
</tr>
<tr>
<td>getConfigParameter(String parameter name)</td>
<td>Returns the value of the named configuration parameter.</td>
</tr>
<tr>
<td>include(String script include)</td>
<td>Include the MID Server script include with the given name into the current context.</td>
</tr>
<tr>
<td>getName()</td>
<td>Returns the name of the MID Server.</td>
</tr>
<tr>
<td>getSysID()</td>
<td>Returns the sys_id of the MID Server.</td>
</tr>
<tr>
<td>toJavaScript(Object)</td>
<td>Converts the given Java object into the equivalent JavaScript object.</td>
</tr>
</tbody>
</table>

This example writes a message to the log:

ms.log('Attempting to log in with user: ' + this.getParameter('user'));

Synchronize a JAR file to MID Servers

You can upload a JAR file to an instance and synchronize it to all MID Servers, or write custom probes that use the synchronized JAR file.

Role required: admin, agent_admin

The MID Server JAR File [ecc_agent_jar] table is domain separated. You can create versions of these policies that only a MID Server from the same domain can use. For instructions, see Set up domain separation for MID servers on page 1677.

Caution: Synchronizing a JAR file with this procedure causes all MID Servers connected to the instance to restart automatically.

1. Navigate to MID Server JAR Files.
2. Click New.
3. Complete the following fields:
• Name: A unique and descriptive name for identifying the file in the instance.
• Version: A version number for the file, if one is available.
• Source: Location of the JAR file for reference purposes. Source information is not used by the system.
• Description: Short description of the JAR file and its purpose in the instance.

4. Click the paper clip icon in the banner.

5. In the Attachments dialog box, click Browse and select the file you want to attach.
   
   The platform attaches the JAR file to the record and restarts the MID Servers to synchronize the file. It is not necessary to update the record to attach the file.

Set the MID Server JVM memory size

The MID Server starts with a default JVM memory allocation, but you can modify this setting in the configuration file.

Role required: admin

In the base ServiceNow system, the MID Server JVM memory is set to 1024MB, which is configured in the `agent\conf\wrapper-override.conf` file in the MID Server installation directory. This setting might not be appropriate for the way your organization uses the MID Server. If you want the MID Server to work harder, allocate more resources to it. If the MID Server is located in a small branch office and runs in an environment where memory allocation is shared between a print server, mail server, or web proxy server, the allocation might have to be reduced.

---

**Note:** For a complete list of minimum MID Server requirements, see [MID Server system requirements](#) on page 1583.

1. Open the `\ServiceNow\<MID Server name>\agent\conf\wrapper-override.conf` file in a text editor.
   
   For more information about this file, see [Installing Multiple MID Servers on a Single System](#).

2. Locate the following lines in the file:
   
   ```
   # OPTIONAL: Maximum Java Heap Size (in MB)
   wrapper.java.maxmemory=1024
   ```

3. Edit the memory allocation.

4. Remove the comment tag (`#`) from the memory allocation parameter.

5. Save the file.
6. Restart the MID Server service.

Set MID Server thread use

If the MID Server is running on a host containing many other programs that must compete for CPU time, fewer threads than the default of 25 might be necessary.

Role required: admin

You can set the MID Server to use as few as 5 threads without issues. If the MID Server needs more speed, and the host is powerful enough or lightly loaded with other programs, raise the thread setting. The thread limit depends on the hardware and the operating system of the host. You might have to experiment to find the optimal value for your situation. The following general observations may be useful:

- Most MID Server tasks require file handles to do their job.
- Windows: On the Windows operating system, file handles are available in a fixed quantity. If you configure too many MID Server threads on a Windows host, the MID Server can consume all the file handles before approaching maximum CPU usage. This situation appears as an Out of file handles error in the MID Server log and indicates that the MID Server is trying to use too many threads.
- UNIX and Linux: UNIX and Linux hosts have a much different scheme for allocating file handles. Generally, you can increase MID Server thread use on these operating systems until the CPU of the host is overloaded. See your OS documentation for monitoring CPU usage.
- Each thread on the MID Server requires some memory. Exactly how much memory varies considerably from task to task and depends on the equipment being discovered. To increase the number of threads, you might have to increase the amount of memory that Java uses. If you configure insufficient memory, an Out of memory error appears in the MID Server log.

Follow the steps below to change the config.XML file. Alternatively, use the threads.max connection parameter.

1. Open the \agent\config.xml file using any text editor.
2. Locate the following lines:
   ```xml
   <!-- MID Server Threads --><parameter name="threads.max" value="25"/>
   ```
3. Edit the value. Keep in mind the cautions described above.
4. Save the record.
5. Restart the MID Server service.

ECC queue retry policy

Define retry policies for outbound Web Services that are executed via the ECC Queue table.

Retry policies specify a matching error condition for ECC Queue input records that are a result or response of an output queue record, the interval for retry, and the maximum number of retries. Because it matches on the input queue record, the retry policies only work when an input ECC Queue record is expected, and therefore requires that the outbound messages are queued on the ECC Queue table as well. Advanced matching criteria may be specified using script.

Retry activity

The retry activity records document each attempt to retry the output queue record.

When the current policy is being retried, the Status of the activity will indicate Retrying. When all retries are exhausted, e.g. the maximum number of retries have occurred and the output queue still failed, the
Status field will indicate a Failed state. Otherwise, at anytime during the retry, if the request then becomes successful, it indicates Succeeded.

![Queue Retry Activity Table]

You may also display the current list of retry activities and their states by selecting the Queue Retry Activity module.

**Figure 327: Queue Retry Activity**

You may also display the current list of retry activities and their states by selecting the Queue Retry Activity module.
<table>
<thead>
<tr>
<th>Created</th>
<th>Policy</th>
<th>Input queue</th>
<th>Retry queue entry</th>
<th>Retry count</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011-03-04 11:28:02</td>
<td>SOAPClient java.net.UnknownHostException</td>
<td><a href="http://www.webservices.net/stockquote.asmx">http://www.webservices.net/stockquote.asmx</a></td>
<td><a href="http://www.webservices.net/stockquote.asmx">http://www.webservices.net/stockquote.asmx</a></td>
<td>1</td>
<td>Retrying</td>
</tr>
<tr>
<td>2011-03-04 11:33:12</td>
<td>SOAPClient java.net.UnknownHostException</td>
<td><a href="http://www.webservices.net/stockquote.asmx">http://www.webservices.net/stockquote.asmx</a></td>
<td><a href="http://www.webservices.net/stockquote.asmx">http://www.webservices.net/stockquote.asmx</a></td>
<td>1</td>
<td>Retrying</td>
</tr>
<tr>
<td>2011-03-04 11:34:10</td>
<td>SOAPClient java.net.UnknownHostException</td>
<td><a href="http://www.webservices.net/stockquote.asmx">http://www.webservices.net/stockquote.asmx</a></td>
<td><a href="http://www.webservices.net/stockquote.asmx">http://www.webservices.net/stockquote.asmx</a></td>
<td>3</td>
<td>Succeeded</td>
</tr>
<tr>
<td>2011-03-07 00:00:58</td>
<td>SOAPClient java.net.UnknownHostException</td>
<td><a href="http://www.webservices.net/stockquote.asmx">http://www.webservices.net/stockquote.asmx</a></td>
<td><a href="http://www.webservices.net/stockquote.asmx">http://www.webservices.net/stockquote.asmx</a></td>
<td>1</td>
<td>Retrying</td>
</tr>
<tr>
<td>2011-03-07 00:01:29</td>
<td>SOAPClient java.net.UnknownHostException</td>
<td><a href="http://www.webservices.net/stockquote.asmx">http://www.webservices.net/stockquote.asmx</a></td>
<td><a href="http://www.webservices.net/stockquote.asmx">http://www.webservices.net/stockquote.asmx</a></td>
<td>2</td>
<td>Retrying</td>
</tr>
<tr>
<td>2011-03-07 00:01:58</td>
<td>SOAPClient java.net.UnknownHostException</td>
<td><a href="http://www.webservices.net/stockquote.asmx">http://www.webservices.net/stockquote.asmx</a></td>
<td><a href="http://www.webservices.net/stockquote.asmx">http://www.webservices.net/stockquote.asmx</a></td>
<td>3</td>
<td>Succeeded</td>
</tr>
<tr>
<td>2011-03-07 00:04:00</td>
<td>SOAPClient java.net.UnknownHostException</td>
<td><a href="http://www.webservices.net/stockquote.asmx">http://www.webservices.net/stockquote.asmx</a></td>
<td><a href="http://www.webservices.net/stockquote.asmx">http://www.webservices.net/stockquote.asmx</a></td>
<td>1</td>
<td>Retrying</td>
</tr>
<tr>
<td>2011-03-07 00:04:29</td>
<td>SOAPClient java.net.UnknownHostException</td>
<td><a href="http://www.webservices.net/stockquote.asmx">http://www.webservices.net/stockquote.asmx</a></td>
<td><a href="http://www.webservices.net/stockquote.asmx">http://www.webservices.net/stockquote.asmx</a></td>
<td>2</td>
<td>Retrying</td>
</tr>
<tr>
<td>2011-03-07 00:04:59</td>
<td>SOAPClient java.net.UnknownHostException</td>
<td><a href="http://www.webservices.net/stockquote.asmx">http://www.webservices.net/stockquote.asmx</a></td>
<td><a href="http://www.webservices.net/stockquote.asmx">http://www.webservices.net/stockquote.asmx</a></td>
<td>3</td>
<td>Succeeded</td>
</tr>
<tr>
<td>2011-03-07 00:11:21</td>
<td>SOAPClient java.net.UnknownHostException</td>
<td><a href="http://www.webservices.net/stockquote.asmx">http://www.webservices.net/stockquote.asmx</a></td>
<td><a href="http://www.webservices.net/stockquote.asmx">http://www.webservices.net/stockquote.asmx</a></td>
<td>1</td>
<td>Retrying</td>
</tr>
<tr>
<td>2011-03-07 00:11:31</td>
<td>SOAPClient java.net.UnknownHostException</td>
<td><a href="http://www.webservices.net/stockquote.asmx">http://www.webservices.net/stockquote.asmx</a></td>
<td><a href="http://www.webservices.net/stockquote.asmx">http://www.webservices.net/stockquote.asmx</a></td>
<td>2</td>
<td>Succeeded</td>
</tr>
</tbody>
</table>

Figure 328: Queue Retry Activities
Retry policy example

This retry policy defines the matching criteria when an UnknownHostException response is received during a SOAPClient (outbound SOAP message invocation) call.

![Queue Retry Policy Table]

The policy will only match if the Agent, Topic, ECC Name (matches the Name field), and Source fields match that of an input ECC queue record. Additionally, the Condition and Condition script criteria will also have to match "State == error" and the error_string field contains the text java.net.UnknownHostException.

When these conditions are met, and an input record is matched, it will retry the originating output queue record after 15 seconds, and for a maximum of 3 times.

Figure 329: Default Queue Retry Policy

The policy will only match if the Agent, Topic, ECC Name (matches the Name field), and Source fields match that of an input ECC queue record. Additionally, the Condition and Condition script criteria will also have to match "State == error" and the error_string field contains the text java.net.UnknownHostException.

When these conditions are met, and an input record is matched, it will retry the originating output queue record after 15 seconds, and for a maximum of 3 times.

The MID Server ECC Queue

The External Communication Channel (ECC) Queue is a connection point between an instance and the MID Server. Jobs that the MID Server needs to perform are saved in this queue until the MID Server is ready to handle them.

The MID Server subscribes to messages published by the Asynchronous Message Bus (AMB), which notifies the MID Server that it has pending tasks in the ECC Queue. If a job exists in the ECC Queue
for that MID Server, the MID Server sets the status to "I'm working on it." When finished working on a requested job, the MID Server reports back to the ECC queue with the results.

You can access the ECC Queue by navigating any of these paths:

- Discovery Output and Artifacts ECC Queue
- Discovery Discovery Schedules {schedule name} {Discovery status record}
- ECC Queue
- {Discovery Status record} ECC Queue

### ECC Queue fields

An ECC Queue provides the following information:

<table>
<thead>
<tr>
<th>Field</th>
<th>Input value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agent</td>
<td>The name of the external system that this messages is either from or to. If the message is from or to a MID Server, the agent name is in the form mid.server.xxx, where xxx is the name of a particular MID Server.</td>
</tr>
<tr>
<td>Topic</td>
<td>The name of the probe the MID server ran. If you are using a pattern for discovery, the Horizontal Pattern probe appears.</td>
</tr>
<tr>
<td>Name</td>
<td>The actual command the probe ran. For example, if Topic is SSHCommand, then the Name field contains the actual shell command to run. If you are using a pattern for discovery, the following appears: Pattern Launcher: followed by the name of the pattern and the multipage number.</td>
</tr>
<tr>
<td>Source</td>
<td>The IP address that the discovery is to run against. A few probes run against multiple IP addresses; in those cases, this field contains a human-readable description.</td>
</tr>
<tr>
<td>Response to</td>
<td>This optional field contains a reference (sys_id) to the ECC Queue message that this message is in response to. Discovery makes extensive use of this field to track the hierarchy of messages that result from a given scheduled Discovery. Click the record icon for the value in this field to open the ECC Queue record for the activity that spawned the current probe or sensor record.</td>
</tr>
<tr>
<td>Queue</td>
<td>An indicator of whether this message was an input message or an output message.</td>
</tr>
<tr>
<td>State</td>
<td>The state of the current ECC queue record. States update automatically.</td>
</tr>
<tr>
<td>Processed</td>
<td>The time when this message was processed.</td>
</tr>
<tr>
<td>Created</td>
<td>The time when this message was created.</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Field</th>
<th>Input value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sequence</td>
<td>The unique sequence number for this message. This value is automatically generated when an ECC Queue record is inserted. Its use is deprecated.</td>
</tr>
<tr>
<td>Error string</td>
<td>An error message, if an error occurred during processing. This field is hidden on the standard form unless there was an error.</td>
</tr>
<tr>
<td>Payload</td>
<td>The body of the message in XML format. The returned XML has a root tag of &lt;results&gt; containing one or more &lt;result&gt; tags and a single &lt;parameters&gt; tag. The parameters are simply an echo of those sent to the MID server in the probe; they vary from probe to probe, but in general they tell the probe the details of what it is to do and how it should behave. The result tags are the most interesting ones: they contain the actual data generated by the probe.</td>
</tr>
</tbody>
</table>

**ECC queue controls**

The ECC Queue form contains these related links:

<table>
<thead>
<tr>
<th>Related link</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Run again</td>
<td>Runs the probe again. You can re-run probes when you encounter a failed discovery or other unexpected results.</td>
</tr>
<tr>
<td>Go to CMDB item</td>
<td>Open the CI record for the CI that was updated during the discovery.</td>
</tr>
<tr>
<td>Go to Sensor</td>
<td>Open the record for the associated sensor.</td>
</tr>
</tbody>
</table>

**Manage ECC Queue content for a MID Server**

The ECC Queue allows you to create ECC Queue messages, access MID Server log entries, and retrieve statistics from an individual MID Server record.

Role required: admin, mid_server

1. Send remote commands through a MID Server to a hosting device directly from the ECC Queue without running Discovery.
   a) Navigate to the ECC Queue and click New.
   b) Create a message with these settings:
      - Agent: The name of the MID Server that executes the command.
      - Topic: Command
      - Name: The actual command that you want to process. For Windows, this is expressed in a DOS command line structure. For Linux, the structure could be a bash command line entry.
      - Queue: Output
• Payload: With proper XML tags, you can specify the command here instead of in the Name field. The advantage to this is that the command is not restricted by the Name field length of 120 characters. Use the following XML format for the command:

```xml
<parameters>
  <parameter name="name" value="ACTUAL_COMMAND_LINE"/>
</parameters>
```

2. Access entries in the ECC Queue that show agent0.log.0 logs and wrapper.log logs for an individual MID Server.

   a) Open a MID Server record.
   b) Under Related Links, click Grab MID Logs.

      ECC queue records appear in the list using the following filter:
      - [Topic] [is] [SystemCommand]
      - [Source] [is] [grabLog]
      - [Agent] [is] [your MID Server]

      Only agent0.log.0 and wrapper.log entries appear. These logs are also accessible in the ~\agent \logs\ file path.
   c) To open a log entry, click the link under the Created column.

3. Access the queue.stats topic for useful information about individual MID Servers, such as memory and CPU usage data.

   a) Open a MID Server record.
   b) Under Related Links, click MID Statistics.

      ECC queue records appear in the list using the following filter:
      - [Topic] [is] [queue.stats]
      - [Agent] [is] [your MID Server]

MID Server cluster configuration

MID Server clusters enable multiple MID Servers with the appropriate capabilities to be grouped together for load balancing and fail-over protection.

External data sources

For performance and reliability reasons, these data sources should not be used with MID Server clusters:

- LDAP
- Export sets
- JDBC data sources

These external data sources should only be used with dedicated MID Servers.
How clusters work

MID Servers in clusters must be able to connect to the instance and to all the devices with which they are expected to communicate. If all MID Servers in a cluster are down, the discovery is canceled. Make sure all the MID Servers are added to any Access Control List (ACL) in use. MID Server clusters are managed by a business rule called MID Server Cluster Management, which checks to see if the MID Server assigned to a job in the ECC Queue belongs to a cluster.

Load balancing

If the cluster business rule determines that a MID Server is part of a load balancing cluster, the application using the MID Server automatically balances the work between the MID Servers in that cluster. It is good practice to put MID Servers with the same capabilities in a load balancing cluster.

Fail-over protection

MID Servers in a fail-over cluster each have a configured order that the platform uses to determine which MID Server to use next in case of failure. MID Servers in a fail-over cluster work independently and do not load balance with other MID Servers in that cluster (although they might also be members of load balancing clusters). When a MID Server fails, the MID Server Cluster Management business rule selects the highest available MID Server in the order to take over the work. The selected MID Server checks the ECC Queue and starts with jobs that are either Processing or Ready.

Note: MID Server clustering does not supported the ECC queue topics Command or SystemCommand. If these commands are received, the clustered MID Servers do not redirect the ECC queue to another MID Server. The ECC queue records stay on the ECC queue without being processed.

Configure a fail-over MID Server with at least the same capabilities as the MID Server it is intended to relieve.

Note: If a MID Server fails while the Shazzam probe is running and auto-selection is configured, failover is not available. The Shazzam discovery stops. Discovery does not automatically choose another MID Server.

MID Server cluster event

The following event is triggered when the platform cannot find a MID Server with the appropriate capabilities to replace a MID Server in a fail-over cluster. Use this event to create an email to notify appropriate users that the cluster has failed.
Table 634: MID Server cluster event

<table>
<thead>
<tr>
<th>Event</th>
<th>Table</th>
<th>Description</th>
<th>Business Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>mid_server.cluster.down</td>
<td>MID Server Cluster [ecc_agent_cluster]</td>
<td>A MID Server cluster has failed</td>
<td>MID Server Cluster Management</td>
</tr>
</tbody>
</table>

**Combining clusters**

A MID Server can be added to both types of clusters at the same time. This diagram shows a scenario in which a MID Server from a load balancing cluster (MID Server D) is also present in a fail-over cluster. If MID Server D fails, MID Server E in the failover cluster is available to the load balancing cluster to perform the tasks previously assigned to MID Server D.

![Diagram of combining clusters]

**Specifying a specific MID Server cluster**

You can specify a specific MID Server cluster for a Discovery schedule. The discovery process uses that cluster only. You cannot chain clusters or specify a single MID Server that belongs to multiple clusters.

**Configure a MID Server cluster**

Configure a cluster of MID Servers for either failover or load balancing.

*Role required: admin*

You can select a MID Server cluster from the Discovery Schedule form.

1. Navigate to MID Server Clusters.
2. Click New.
3. Name the cluster and select the cluster type: Failover or Load Balance.
4. Right click in the header bar and select Save from the context menu.
5. Click Edit in the Includes MID Servers Related List.
6. Select appropriate MID Servers for this cluster from the slushbucket.

**Note:** All MID Servers in a cluster should have capabilities defined. Ensure that each MID Server has the appropriate capabilities for the job. A MID Server in a fail-over cluster must have the same capabilities (or expanded capabilities) as the MID Server it is expected to replace.
MID Server capabilities

MID Server capabilities define the specific functions of a MID Server within an IP address range.

Several applications, such as Discovery, Service Mapping, Cloud Management, and Orchestration can use capabilities, IP ranges, and MID Server selection on page 1630 to narrow the pool of MID Servers the applications need.

Note: At least one capability is required for each MID Server used by Orchestration. See MID Servers for Orchestration on page 2103 for more information.

The following capabilities are available by default with Discovery:

- All
- Cloud Management
- Nmap
- PowerShell
- Resolve DNS
- REST
- SNMP
- SOAP
- SSH
- VMware
- WMI

Nmap capability

The Nmap capability is only assigned to MID Servers for which the Network Mapper (Nmap) scanner has been installed for credential-less Discovery. This capability cannot be added to or removed from any MID Server manually. For instructions on installing or uninstalling Nmap, see Install and uninstall Nmap on a MID Server on page 1694

MID Server capability values

Capabilities provided in the base system do not have a defined value string. A MID Server configured to use a capability that has no value can locate any device using that capability's protocol. If a capability has a defined value, the MID Server using that capability finds only those devices using that protocol that match the value string exactly. The exception to this is the Resolve DNS capability, which is configured to resolve any DNS name into an IP address using a partial string match.

Starting with the London release, the [capability name]:[value] combination appears in the slushbucket when you add a capability to a MID Server. This combination allows you to see all the capabilities that have different values, even if the capability name is the same. For example, if you are using the Cloud Management capability, and you use the value field to specify the us-west logical datacenter on one of the capability records, you can see the combination in the Collection list.
Scripted MID Server capability value matching

You can use value tests to create capabilities that find devices using values without requiring exact string matching. Action on these values is controlled by a user-defined script.

The Resolve DNS capability is provided in the base system and is configured to resolve DNS names into IP addresses for devices whose names end with a specified domain name. The capability Value entered is automatically prefaced with a dot during processing to match domain syntax. This value can contain one or more sub-domains, but must include the end of the domain string. Matching devices must end with the identical syntax. The script for the Resolve DNS capability determines if a device name matches the criteria defined by Value. If a match exists, the platform performs the address resolution automatically. For example, if the value for the Resolve DNS capability is service-now.com, the MID Server with this capability finds lnxlab01.sandiego.service-now.com and dbsrv101.sanjose.service-now.com. If the value is changed to sandiego.service-now.com, then the MID Server finds only lnxlab01.

**Note:** If Value in the Resolve DNS capability is blank, then all domains match.

To view the script for evaluating this capability, navigate to MID Server Capability Value Tests and select Resolve DNS from the list.
Configure MID Server capabilities

A capability is required for each MID Server to work with Orchestration, Cloud Management, Service Mapping, and alert aggregation and RCA.

Role required: admin or sm_admin

1. Navigate to MID Server Capabilities.
2. Select an existing capability. You can also select ALL to include all capabilities.

   **Note:** Ensure that each IP address range has MID Servers with the necessary capabilities to complete the Orchestration activities on that network segment.

3. Create a new capability:
   a) Click New.
   b) Configure the value for a custom capability.
      An example is a capability for DOMAIN, with a value of service-now.
   c) Click Submit.

4. Click Edit in the MID Servers related list to add MID Servers to the capability.
5. Select one or more MID Servers for this capability from the slushbucket.
6. Click Save.
   The capability defined here also appears in the primary record for this MID Server.

### MID Server troubleshooting

The Knowledge Base on Hi contains several articles to help you troubleshoot MID Server issues.

<table>
<thead>
<tr>
<th>The MID Server Troubleshooting Guide</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>KB0597571</strong></td>
</tr>
<tr>
<td>Start here if you are experiencing symptoms such as the MID Server going down or not responding, or CIls being duplicated during discovery.</td>
</tr>
</tbody>
</table>

You can also see the following video on NOWsupport YouTube channel: *How to set up a MID Server*

### MID Server active issues

The ServiceNow® instance has a dedicated table that publishes active issues with MID Servers and alerts administrators when a MID Server is in danger of exceeding its resources.

The MID Server Issue [ecc_agent_issue] table displays a number of common issues that a MID Server can experience, as they occur. Error checking processes attempt to pinpoint the most likely cause of the issue. Informative error messages name the affected MID Server and explain the possible cause of the issue.

The ecc_agent_issue table retains its records for 30 days.

To access records in this table, navigate to MID Server Server Issues.

Supported MID Server active issues:

- Bad user credentials after instance cloning.
- Unsupported Java Runtime Environment (JRE) on the MID Server host.
- Approaching resource thresholds for CPU usage and JVM memory.
- Errors detected during pre-upgrade testing.
- User authentication and authorization failures.
- Network connectivity interruptions and role configuration errors.
Active MID Server post-cloning credential issues

The system provides automatic processes to detect and notify you of possible MID Server credential issues after instance cloning.

During an instance clone, the MID Server [ecc_agent] table is not copied from the source instance, but the User [sys_user] table is copied. As a result, the source MID Server user credentials copied into the target instance might not match those used by the existing set of MID Servers used by the target. Bad credentials can cause those MID Servers to be down for the target instance. Processes on the instance notify you if a MID Server is down from suspected bad credentials following an instance clone.

Table for post-cloning credential issues

The MID Server Issue [ecc_agent_issue] table stores active MID Server issues after an instance clone. Records in this table show a MID Server's current state, evaluation times, and the Issue source. For cases
in which a MID Server for a cloned instance is down because of possible bad credentials, the Issue source is InstanceClone. Data from the MID Server Issue [ecc_agent_issue] table are displayed in a related list on a MID Server record. Records in this table are removed after 10 days, regardless of their state. Ongoing issues reappear as they occur.

**Post-cloning cleanup script and scheduled jobs**

A cleanup script called Bad MID Server credentials after clone runs on the target instance after cloning and calls a script include called BadMIDCredentialAfterClone. This script include schedules the execution of the following jobs on the Schedule Item [sys_trigger] table:

- BadMIDCredentialAfterClone-1: Runs 15 minutes after clone execution.
- BadMIDCredentialAfterClone-2: Runs 75 minutes after clone execution.

These jobs log to the MID Server Issue [ecc_agent_issue] table any MID Servers that existed on the target instance prior to the clone that are in the Down state. These MID Servers are not ready for normal processing and might be down due to invalid credentials resulting from the cloning process. The state of MID Servers added to the target instance after the clone is not evaluated.

---

**Note:** The MID Server log shows that the MID Server user associated with the target instance could not be authenticated or was missing the proper role.

---

**Business rule that checks for bad credentials**

The Check for bad MID credential after clone business rule monitors the MID Server [ecc_agent] table for MID Servers that are transitioning from Down to Up. If the business rule finds a MID Server making that transition, the rule attempts to find a matching MID Server in the MID Server Issue [ecc_agent_issue] table that has an issue source of InstanceClone and a state other than Resolved. If a match is found, the business rule updates the state of the MID Server in the [ecc_agent_issue] table to Resolved.

**Resolving MID Server issues**

The error message in the MID Server Issue [ecc_agent_issue] table names the affected MID Server user. This message appears each time the business rule runs and finds a MID Server that is down from suspected bad credentials:

MID Server not operational (status: Down), possibly due to recent clone.
Verify credentials for logged in User 'local-midserver'.

Attempt to resolve the issue first by comparing the user's credentials with the credentials that the affected MID Server is expecting. If the credentials are incorrect, fix the problem and check the MID Server status again. If the credentials are correct, but the MID Server remains down, check the Knowledge Base for other possible causes.

**MID Server resource threshold alerts**

The instance displays warnings when a MID Server breaches its resource thresholds for CPU and JVM memory usage, enabling users to create email notifications or custom scripts when a breach occurs.

The MID Server Issue [ecc_agent_issue] table warns users when a MID Server exceeds configured thresholds of its allocated CPU and memory resources. These warnings are published before the MID Server experiences performance degradation or an out-of-memory error, enabling the administrator to increase resources and avoid downtime. Administrators can use a registered event to send email notification to selected recipients, advising them of any threshold breaches, or to create a custom script
to do some other type of work. The instance continues to update the MID Server Issue [ecc_agent_issue] table to keep unresolved issues current.

By default, CPU and memory threshold alerts are disabled and no alerts are published to the MID Server Issue [ecc_agent_issue] table. To enable both types of alerting, add these properties to the System Property [sys_properties] table, and then set their values to true:

• mid.threshold.resource.breach.enable.cpu.alerts
• mid.threshold.resource.breach.enable.memory.alerts

For details on adding system properties to the platform, see Add a property using sys_properties.list.

**Evaluation process**

This processing occurs whether or not alerting is enabled:

1. Every 10 minutes, each MID Server transmits its CPU and memory consumption metrics to the instance. The instance inserts CPU metrics into the Mean CPU used % field of the ECC Agent Scalar Metrics [ecc_agent_scalar_metric] table and memory metrics into the Max memory used % field of the ECC Agent Memory Metrics [ecc_agent_memory_metric] table.

2. After a successful insert, the following business rules run on each table, invoking a script include that calls an appropriate function. Each function takes an average of the metric sets inserted into the tables, based on the configured sampling intervals.

   • Update cpu mean on MID Server Status: Calls the MIDResourceThresholdBreach.checkCpuUsage() script include.
   • Update max memory on MID Server Status: Calls the MIDResourceThresholdBreach.checkMemoryUsage script include.

Each function takes an average of the metric sets inserted into the tables, based on the configured thresholds and sampling intervals. The instance first looks at each MID Server for configuration parameters that set custom threshold values or sampling intervals for that MID Server. If no configuration parameters for these attributes are found, the instance looks in the System Properties [sys_properties] table for custom values to use. If no properties are found, the instance uses the default threshold and interval values from the code.

**Note:** Both the threshold percentages and the sampling intervals are configurable. See Configuring thresholds and sampling intervals on page 1725 for details.

**Alerting process**

When alerting for CPU or memory thresholds is enabled, this processing occurs:

1. If the aggregated average metric value equals or exceeds the configured percent threshold, the instance triggers the mid.threshold.resource.breach event. Administrators can use this event to create email notifications for threshold breach alerts or to create a custom script.

2. The instance inserts a record of the breach into the MID Server Issue [ecc_agent_issue] table with a State value of New and a Count of 1, and then publishes a message containing all the pertinent details of the breach. An example of this message is Mean CPU used % has exceeded threshold (96>=91) for a 40 minute interval span, occurring after start date 2017-01-11 14:25:19. This message appears in the Short description field of the MID Server Issue form and in the event. You can copy any part of the message into your email notifications.
**MID Server issue states**

When the administrator first examines an issue in the MID Server Issue [ecc_agent_issue] table, the administrator can change the State of the issue to Acknowledged to indicate that the issue is being addressed. Each time the instance detects a breach, it attempts to match the breach with an existing issue. If a MID Server already has an issue record for that breach in a State of New or Acknowledged, the instance updates the Last Detected field with the current date/time and increments the Count field in the existing record. This prevents the creation of duplicate records in the MID Server Issue [ecc_agent_issue] table and records the number of times after the initial incident that the breach reoccurred. The administrator can increase MID Server resources gradually and watch the effect on the Count field. When the counter stops incrementing, the administrator knows that the MID Server has adequate resources. When the MID Server resource have been adjusted appropriately, the administrator sets the State to Resolved. If a new threshold breach is logged that matches a MID Server issue with a State of Resolved, the instance creates a new issue record.

**Note:** Any record in the MID Server Issue [ecc_agent_issue] table that has not been updated in 30 days is deleted, regardless of its state.

**Recommendations for resolving resource issues**

Administrators have the opportunity to resolve any resource issues with a MID Server when they receive notification of the event. Follow these recommendations for reducing the strain on MID Server resources:

- **JVM memory:**
  - Allocate more max memory to the MID Server. For more information, see *Set the MID Server JVM memory size* on page 1706.
  - Add additional MID Servers to share the workload. For more information, see *MID Server cluster configuration* on page 1713.
  - Reduce the amount of concurrent processing for the MID Server. This includes segmenting IP Address ranges into smaller segments for a Discovery schedule or loading smaller segments of data within an import job.

- **CPU:** Reduce the activity on the host or migrate the MID Server to a new host with more available resources.
### Tables used for resource threshold evaluation

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
</table>
| MID Server Issue [ecc_agent_issue]         | Stores data on various types of MID Server issues, including breaches of configured CPU and memory thresholds. Fields used for resource threshold breaches are:  
• count: Number of times a previously reported threshold breach occurs, if the event is not marked Resolved.  
• last_detected: Current date and time a threshold breach is detected. This field is updated each time a previously detected breach is found, if it is not marked Resolved.  
• message: Descriptive message summarizing the conditions that triggered the threshold breach event. This message includes the actual percentage of CPU and memory calculated and the configured thresholds that were breached.  
• mid_server: Name of the MID Server experiencing the resource threshold breach.  
• source: The issue source for the breach. These are the possible sources:  
  • CpuMIDResourceThresholdBreach: CPU threshold issue sources.  
  • MemoryMIDResourceThresholdBreach: Memory threshold issue sources. |
| MID Server Status [ecc_agent_status]       | Stores the percentages used for the CPU and memory resources, averaged over configurable intervals for each resource. The fields used are:  
• Mean CPU used %  
• Max Memory used % |
| ECC Agent Scalar Metric [ecc_agent_scalar_metric] | Stores the CPU usage data inserted by each MID Server every 10 minutes. The table field used by resource threshold alerting is mean. |
| ECC Agent Memory Metric [ecc_agent_memory_metric] | Stores the memory usage data inserted by each MID Server every 10 minutes. The table field used by resource threshold alerting is max_used_pct. |
Business rules that check for threshold breaches

<table>
<thead>
<tr>
<th>Business rule</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Update cpu mean on MID Server Status</td>
<td>Runs after the MID Server inserts a record into the ECC Agent Scalar Metric [ecc_agent_scalar_metric] table. This business rule triggers the MIDResourceThresholdBreach script include function that evaluates threshold settings to determine if the MID Server has breached its configured CPU resource thresholds.</td>
</tr>
<tr>
<td>Update max memory on MID Server Status</td>
<td>Runs after the MID Server inserts a record into the ECC Agent Memory Metric [ecc_agent_memory_metric] table. This business rule triggers the MIDResourceThresholdBreach script include function that evaluates threshold settings to determine if the MID Server has breached its configured memory resource thresholds.</td>
</tr>
</tbody>
</table>

Configuring thresholds and sampling intervals

You can use the default threshold percentages and sampling intervals or configure custom values using either of these methods:

- **Add system properties** to the instance and change the default values for all MID Servers.
- **Add configuration parameters** to change the default resource values for individual MID Servers.

The system properties and the configuration parameters use the same names.

<table>
<thead>
<tr>
<th>Property/configuration parameter</th>
<th>Description</th>
</tr>
</thead>
</table>
| mid.threshold.mean_cpu.aggregate_interval_span        | Number of 10 minute units in the interval for sampling CPU usage data. The default interval is 30 minutes (3 x 10 min.)  
Default: 3                                                                                         |
| mid.threshold.mean_cpu.percent                        | Usage percentage of the total CPU resources that initiates a threshold breach alert.  
Default: 95                                                                                         |
| mid.threshold.mean_max_memory.aggregate_interval_span | Number of 10 minute units in the interval for sampling memory usage data. The default interval is 30 minutes (3 x 10 min.)  
Default: 3                                                                                         |
| mid.threshold.mean_max_memory.percent                 | Usage percentage of the total memory resources that initiates a threshold breach alert.  
Default: 95                                                                                         |
**MID Server resource reporting**

The *MID Server dashboard* contains two reports that give you views into the consumption of CPU and JVM memory resources. These reports show usage over the previous 30 days.

- **Avg Percentage of CPU Used**: Trending the daily average on CPU usage helps illustrate the amount of CPU processing that the MID Server host consumes. MID Servers deployed on the same host will report the same CPU usage.
- **Avg Percentage of Max Memory Used**: The maximum used percentage (max_used_pct) is a useful metric for determining if the MID Server has enough memory resources. This metric is a percentage of the max used memory over the total available memory. Trending this over time provides a visualization of how much memory is needed by the MID Server.

**MID Server user connectivity issues**

The instance writes issues involving MID Server user logins and network connectivity to the MID Server Issue [ecc_agent_issue] table and creates events you can use in custom scripts or to send email notifications.

Records in the MID Server Issue [ecc_agent_issue] table can provide insight into why your MID Server user cannot log in or why a MID Server cannot connect to the instance. The system displays records for connectivity problems in this table that include informative error messages suggesting possible causes. By default, a scheduled job called MIDUserConnectivity runs every four hours and launches the MIDUserConnectivity script include to evaluate MID Server connection activity. Records in the MID Server Issue [ecc_agent_issue] table reflect the status of MID Server login attempts and connectivity at the time the scheduled job runs.

From the perspective of the instance, the MID Server is Down when:

- User authentication fails
- User authorization fails.
- Network issues prevent MID Server from establishing a TCP/IP connection.

**Note**: To associate a user with a MID Server, navigate to the servicenow/<mid server name>/agent/config.xml file and enter the user credentials in the mid.instance.username and mid.instance.password parameters. Make sure to restart the MID Server to activate your changes.

**How issues are logged**

User authentication failures and authorization issues are logged automatically to the MID Server agent log file. The message for both is the same: User cannot be authenticated or is missing the proper roles. If the issue is related to authorization, the agent.log file shows the list of missing roles.

When debugging is enabled, MID Server issues are logged to the system log (syslog) and are available for display in either a summary or a detailed format. You can also change the sampling interval from the default 4 hours to something shorter for tracking your remediation efforts. For instructions on enabling and configuring debugging for MID Server user issues, see *Test remediation efforts for MID Server user connectivity issues* on page 1733.

**Data provided**

When the instance encounters user connectivity issues, it opens a record in the MID Server Issue [ecc_agent_issue] table.
Figure 331: Example user authentication error message

The MID Server Issue table contains these fields:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last detected</td>
<td>Date and time the issue was last detected.</td>
</tr>
<tr>
<td>Short description</td>
<td>Contents of the generated message that specifies a possible issue with the named user or the MID Server.</td>
</tr>
<tr>
<td>MID Server</td>
<td>Empty in the Jakarta release.</td>
</tr>
<tr>
<td>Issue source</td>
<td>The process that identified the issue. For all issues with MID Server user connectivity, the source is MIDUserConnectivity.</td>
</tr>
</tbody>
</table>
### User authentication failure

The credentials that the instance uses to authenticate a MID Server user are configured in the MID Server Configuration Parameters [ecc_agent_config] table. If the MID Server user attempts to log into the instance with invalid credentials, the instance rejects the connection, and writes the login.failed event to the Events [sysevents] table for the user. Administrators can use this event in a custom script or in email notifications for authentication failure.

**Note:** If user authentication fails, user authorization is not attempted.

#### User accounts associated with a MID Server

Either of the following messages in the MID Server Issue [ecc_agent_issue] table indicate authentication failure for user accounts that are associated with a MID Server:

- Login authentication failure for User `<user name>` associated with 1 down MID Server. Check password on MID server.
- Login authentication failure for User `<user name>` associated with `<n>` down MID Servers. Check password on MID servers.

The necessary conditions for these messages to appear are:

- The Status field in the MID Servers [ecc_agent] table that is associated with the MID Server indicates that the MID Server is Down.
- The user identified in the MID Server Configuration Parameters [ecc_agent_config] table is the user that one or more MID Servers is configured to use for authentication and authorization when connecting to the instance. The record in the [ecc_agent_config] table must have these values:
  - Parameter name [param_name] field set to mid.instance.username.
  - Value [value] field set to the user's name, corresponding to the User ID [user_name] field in Users [sys_user] table.
• The Events [sysevent] table contains posts showing that the last login attempt associated with the user failed during the scheduled time period. The record created in the [sysevent] table contains these field values:
  • Event Name [name] field is set to login.failed.
  • Parm1 [parm1] field is set to the user’s name.

Note: The MID Server [mid_server] field in the MID Server Issues [ecc_agent_issue] table is empty (=NULL).

User accounts with the mid-server role not associated with a MID Server

The following message appears when a user with the mid_server role who is not associated with a MID Server fails to authenticate: Login authentication failure for User <user name> with mid_server role not associated with a MID Server.

The necessary conditions for this message to appear are:
• The User Roles [sys_user_has_role] table contains a record linking the sys_id associated with the user record stored in the [sys_user] table, with the sys_id associated with the mid_server role record stored in the [sys_user_role] table.
• The user is not identified in the MID Server Configuration Parameters [ecc_agent_config] table as the user whom one or more MID Servers are configured to use for authentication and authorization when connecting to the instance.
• The Events [sysevent] table contains posts showing that the last login attempt associated with the user failed during the scheduled time period.
  • The [sysevent] table contains a record with the Event Name [name] field set to login.failed.
  • The Parm1 [parm1] field is set to the user’s name, corresponding to the User ID [user_name] field in Users [sys_user] table.

Note: The MID Server [mid_server] field in the MID Server Issues [ecc_agent_issue] table is empty (=NULL).

User authorization failure

The user authorization check occurs after the MID Server has successfully authenticated on the instance. In this step, the system ensures that the user account associated with a MID Server is granted the minimum roles required. A SOAP web service called MIDServerCheck performs the role checking on the instance. If the MID Server user has the proper roles, the connection is allowed and a login event is written to the Events [sysevents] table. If the user does not have the proper roles, the instance writes a login.authorization.failed event to the Events [sysevents] table. This event provides a comma separated list of the user’s missing roles. Administrators can use this event in custom scripts or in email notifications for authorization failure.

Authorization can fail if a user is missing the mid_server role or any of the important SOAP roles, as in these cases:
• If the user has the soap_script role, the MIDServerCheck SOAP web service runs to check for the appropriate MID Server roles. If the user lacks the mid_server role or any of the other SOAP roles, authorization fails, and the login.authorization.failed event is created.
• If the user is missing the soap_script role, that user is not authorized to launch the MIDServerCheck SOAP web service, which checks for all required MID Server roles. Authorization fails, but the
login.authorization.failed event is not created. When this occurs, the instance displays this message: Connectivity of MID Server user <user name> cannot be detected by the instance.

Users associated with one or more down MID Servers

Either of the following messages in the MID Server Issue [ecc_agent_issue] table indicate authorization failure for user accounts that are associated with a MID Server that is Down:

- Login authorization failure for User <user name> associated with 1 down MID Server. Re-assign mid_server role to grant all required roles.
- Login authorization failure for User <user name> associated with <n> down MID Servers. Re-assign mid_server role to grant all required roles.

The MIDUserConnectivity script include identifies active users associated with one or more down MID Servers whose last login attempt within the reporting period failed user authorization. This message is generated when user authorization failures are detected and reported by the MIDSer verCheck scripted web service. However, user authorization failures are not reported for users who are not assigned the soap_script role. Should this occur, problems with the user are reported by the network connectivity message.

This message appears in the MID Server Issue [ecc_agent_issue] table when:

- The user may or may not have the mid_server role.
- The user is identified in the MID Server Configuration Parameters [ecc_agent_config] table as the user whom one or more MID Servers are configured to use for authentication and authorization when connecting to the instance.
- The Events [sysevent] table contains posts showing that the last login attempt associated with the user failed during the scheduled time period. The [sysevent] table contains a record with these settings:
  - Event Name [name] field set to login.authorization.failed.
  - Parm1 [parm1] field set to the user’s name, corresponding to the User ID [user_name] field in Users [sys_user] table.

**Note:** The MID Server [mid_server] field in the MID Server Issues [ecc_agent_issue] table is empty (=NULL).

Users with the proper role not associated with a MID Server

The following message appears when a user with the mid_server role who is not associated with a MID Server fails authorization: Login authorization failure for User <user name> with mid_server role not associated with a MID Server.

This message is generated when user authorization failures are detected in which the user account, with the mid_server role, is not identified as a configured MID Server user in the [ecc_agent_config] table. It is possible that the user account was associated with a MID Server at the time of the failure.

This message appears in the MID Server Issue [ecc_agent_issue] table when:

- The user has the mid_server role. The User Roles [sys_user_has_role] table has a record linking the sys_id associated with the user record stored in the [sys_user] table, with the sys_id associated with the mid_server role record stored in the [sys_user_role] table.
- The user is not identified in the MID Server Configuration Parameters [ecc_agent_config] table as the user whom one or more MID Servers are configured to use for authentication and authorization when connecting to the instance.
- The Events [sysevent] table contains posts showing that the last login attempt associated with the user failed during the scheduled time period. The [sysevent] table contains a record with these settings:
  - Event Name [name] field set to login.authorization.failed.
Network issues

A network issue can prevent the MID Server from connecting to the instance's TCP/IP server to begin a session. In this case, the instance marks the MID Server as Down, because the instance failed to receive the MID Server heartbeat within the prescribed 5 minute interval.

Users associated with down MID Servers who have not attempted to log in

Either of the following messages in the MID Server Issue [ecc_agent_issue] table name users associated with MID Servers who have not attempted to log in during the reporting period:

- User <user name> is associated with 1 down MID Server. No login attempts within reporting period.
- User <user name> is associated with <n> down MID Servers. No login attempts within reporting period.

The MIDUserConnectivity script includes reports active users associated with down MID Servers where network connectivity cannot be detected by the instance.

This message appears in the MID Server Issue [ecc_agent_issue] table when:

- The user may or may not have the mid_server role.
- The user is identified in the MID Server Configuration Parameters [ecc_agent_config] table as the user which one or more MID Servers are configured to use for authentication and authorization when connecting to the instance.
- There are no login attempts, either failed or successful, recorded in the Events [sysevent] table for the user during the scheduled reporting period.

Users not associated with MID Servers who have not attempted to log in

The following message appears when a user with the mid_server role who is not associated with a MID Server has not attempted to login during the configured reporting interval: User <user name> with mid_server role is not associated with a MID Server. No login attempts within reporting period.

The MIDUserConnectivity script includes reports active users with the mid_server role not associated with a MID Server, where connectivity cannot be detected by the instance.

This message appears in the MID Server Issue [ecc_agent_issue] table when:

- The user has the mid_server role. The User Roles [sys_user_has_role] table has a record linking the sys_id associated with the user record stored in the [sys_user] table, with the sys_id associated with the mid_server role record stored in the [sys_user_role] table.
- The user is not identified in the MID Server Configuration Parameters [ecc_agent_config] table as the user whom one or more MID Servers are configured to use for authentication and authorization when connecting to the instance.
- There are no login attempts, either failed or successful, recorded in the Events [sysevent] table for the user during the scheduled reporting period.
Configuration issues

Any of the following messages, discussed above, can indicate a configuration issue:

- Login authentication failure for User <user name> with mid_server role not associated with a MID Server.
- Login authorization failure for User <user name> with mid_server role not associated with a MID Server.
- User <user name> with mid_server role is not associated with a MID Server. No login attempts within reporting period.

These are some common configuration errors:

- An administrator neglected to associate the user record with the MID Server record as shown in the MID Server Configuration Parameters [ecc_agent_config] table. This table is read-only and cannot be updated directly. To associate a user with a MID Server, configure the user name and password in the MID Server's config.xml file and restart the MID Server.
- During the process of reconfiguring a MID Server to use a different account for TCP/IP connection, the administrator has not yet removed the mid_server role from the account or deleted the account.
- A multipurpose user account was created and granted a large number of roles, including the mid_server role, although this account was never intended to be used as a MID Server account.

User who successfully authenticates and authorizes but might not need mid_server role

The following message appears when a user with the mid_server role who is not associated with a MID Server successfully logs in: User <user name> with mid_server role successfully connected but not associated with a MID Server. The mid_server role should be reserved for MID Server use only.

The MIDUserConnectivity script includes reports active users with the mid_server role who are not identified as a configured MID Server user, and whose last login attempt was successful during the scheduled time period. This message suggests that the user's credentials are being used by a system administrator or a process that is not running on a MID Server. The assumption here is that the mid_server role should only be used for applications deployed to a MID Server. The presence of this message reminds the system administrator to remove extraneous mid_server roles from user accounts that do not require them.

This message appears in the MID Server Issue [ecc_agent_issue] table when:

- The user has the mid_server role.
- The user is not identified in the MID Server Configuration Parameters [ecc_agent_config] table as the user whom one or more MID Servers are configured to use for authentication and authorization when connecting to the instance.
- The Events [sysevent] table contains posts showing that the last login attempt associated with the user succeeded during the scheduled time period. The [sysevent] table contains a record with these settings:
  - Event Name [name] field set to login.
  - Parm1 [parm1] field set to the user's name, corresponding to the User ID [user_name] field in Users [sys_user] table.

Note: The MID Server [mid_server] field in the MID Server Issues [ecc_agent_issue] table is empty (=NULL).
Test remediation efforts for MID Server user connectivity issues
After attempting to resolve a user connectivity issue that appears in the MID Server Issue [ecc_agent_issue] table, you can test your remediation efforts without having to wait until the next scheduled reporting period by shortening the sampling interval.

Role required: admin

Reconfigure the sampling interval using this procedure and then examine the results in the MID Server Issue [ecc_agent_issue] table. You can set any time span for the sample, but you should define a window of not less than 5 minutes, since this is the default interval of the MID Server heartbeat that reports its status. The recommended method for configuring a shorter sampling interval is to copy and modify the code from the MIDUserConnectivity scheduled job, and then run it manually in the background script utility.

**Caution:** Avoid editing the script in the MIDUserConnectivity schedule record. If you make any change to this record, it will not be updated when you upgrade the instance.

1. Navigate to System Definition Scheduled Jobs.
2. Open the MIDUserConnectivity scheduled job.
3. Copy this line from the Run this script field:
   
   ```
   MIDUserConnectivity(0).checkConnectivity(4 * (60 * 60 * 1000));
   ```

   This code sets the 4 hour sampling interval in milliseconds and turns debugging off with the MIDUserConnectivity(0) value.
4. Navigate to System Definition Scripts - Background.
5. Paste the code from the scheduled job into the Run script field.
6. Set the sampling interval to 5 minutes by changing the time calculation to (5 * 60 *1000). The modified command looks like this: MIDUserConnectivity(0).checkConnectivity (5 * 60 *1000);
7. Click Run script.
8. Open the record of the MID Server that had the issue and select the MID Server Issues related list. The issue is updated as follows:
   - If the issue persists, the Count column is incremented, and the Last detected column shows the current date and time.
   - If the issue no longer exists, the system changes the State to Resolved.
9. Optionally, you can enable debugging by selecting a level, and then run the script again to see the breakdown for each condition evaluated.

Use these settings to select a debugging level:
- For a summary view, enter MIDUserConnectivity(1).
- For a detailed view, enter MIDUserConnectivity(2).

For details about the type of debugging information provided, see *Interpreting MID Server user debugging output* on page 1733.

*Interpreting MID Server user debugging output*

Debugging output from the system log is available in either a summary or detailed view for MID Server user issues, but must be enabled manually.

To enable debugging and display all connectivity issues in either of the available formats, you must run a method manually on your instance. For instructions on enabling debugging, see *Test remediation efforts for MID Server user connectivity issues* on page 1733. For information about each error condition and how records are created in the MID Server Issue [ecc_agent_issue] table, see *MID Server user connectivity issues* on page 1726.
Available formats

You can configure the instance to generate a simple summary of the issue or a detailed output that identifies users and MID Servers. Summaries provide a quick look at the issue conditions, by count, while the detailed view allows you to examine roles, MID Server associations, and login activity by named users.

In this summary example of an authorization issue, the instance evaluates each condition and indicates how many users met that condition. You can see that a MID Server is down and that one of two users configured for a MID Server failed authorization. Because this is a summary, neither the MID Server nor the users are named.

Figure 332: Sample summary debug output

Authentication failure

When a MID Server user cannot authenticate on the instance, the system displays these error messages in the detailed output:

- Login authentication failure for User <user name> associated with 1 down MID Server. Check password on MID server.
- Login authentication failure for User <user name> associated with <n> down MID Servers. Check password on MID servers.
- Login authentication failure for User <user name> with mid_server role not associated with a MID Server.

In this example, three users with the mid_server role, midserver2, local-midserver, and ardis.maison, failed to authenticate. Two of these users were configured for MID Servers that were Down, and the other user was not configured for any MID Servers. Each of these users has an authentication failure and is named in the appropriate error message.
London  ServiceNow  Now Platform Capabilities

Figure 333: Detailed debugging log for authentication failure

1735
MID Server ID map

The debugging output lists all MID Servers that are marked as Down and maps them to their user accounts by the MID Server sys_id. This map includes all user accounts that have the mid_server role, whether or not they are associated with a MID Server. If there are no Down MID Servers, the map is not displayed in the debugging output.

The map is presented in three sections:

- User accounts not associated with any MID Servers.
- User accounts associated with Down MID Servers, identified by their sys_id.
- The sys_id of each Down MID Server, identified by name.

Figure 334: MID Server ID map

Authorization failure

If a user is missing any of the required roles, the instance generates these authorization failure messages:

- Login authorization failure for User <user name> associated with 1 down MID Server. Re-assign mid_server role to grant all required roles.
- Login authorization failure for User <user name> associated with <n> down MID Servers. Re-assign mid_server role to grant all required roles.
- Login authorization failure for User <user name> with mid_server role not associated with a MID Server.

In this example, three users with the mid_server role, midserver2, local-midserver, and ardis.maison have failed authorization. One user is not associated with any MID Server, but the other two users are. The system has logged an authorization failure, indicating that the user is missing at least one critical role. To see what roles are missing, look at the comma separated list in the Parm2 field in the login.authorization.failed event record. This record is the most recent login attempt in the Event [sysevent] table for the user account within the reporting period.
Network issues

Network issues may exist for these users who are associated with MID Servers, but who have not attempted to log in during the reporting period:

- User <user name> is associated with 1 down MID Server. No login attempts within reporting period.
- User <user name> is associated with <n> down MID Servers. No login attempts within reporting period.

Network issues may also exist for these users who are NOT associated with MID Servers, and who have not attempted to log in during the reporting period: User <user name> with mid_server role is not associated with a MID Server. No login attempts within reporting period.

In this example, no login attempts have been detected for midserver2, local-midserver, and ardis.maison, all of whom have the mid_server role. Two of those users are associated with MID Servers that are marked Down. The other user is not associated with any MID Server. None of these users has attempted to log in to the system within the configured reporting interval. The system assumes that these users would make an attempt to log in unless network issues prevented them from doing so.

**Note:** By default, the sampling period is 4 hours. However, during debugging or remediation, the sampling period can be reset to a value that matches the MID Server heartbeat interval of 5 minutes, or greater.
Figure 336: Detailed debugging log for network connection issues

**Script**: Log Object: MIDUserConnectivity: activeUserIDsWithMIDServerRole

**Array of 3 elements**

[0]: string = ardis.maison
[1]: string = midserver2
[2]: string = local-midserver

**Script**: Log Object: MIDUserConnectivity: downMIDServerConfiguredUserIDs

**Array of 2 elements**

[0]: string = midserver2
[1]: string = local-midserver

**Script**: Log Object: MIDUserConnectivity: userIDMIDServerMap

**Object**

ardis.maison: Object
  ±sys_domain string = global
  mid_servers: Array of 0 elements
  midserver2: Object
  ±sys_domain string = global
  mid_servers: Array of 1 elements
  [0]: string = 7afaf71514b023a00f170cd3b17669a8
  local-midserver: Object
  ±sys_domain string = global
  mid_servers: Array of 2 elements
  [0]: string = 7afaf71514b023a00f170cd3b17669a8
  [1]: string = 1aa2cd2f3727132e0b709c80f8b96730d string = svc_rba_mid

**Script**: Log Object: configuredMIDServerUserIDs

**Array of 2 elements**

[0]: string = midserver2
[1]: string = local-midserver

**Script**: Log Object: MIDUserConnectivity: activeUserIDsWithMIDServerRoleNotAssociatedWithConfiguredMIDServer

**Array of 1 elements**

[0]: string = ardis.maison

**Script**: Log Object: MIDUserConnectivity: userIDsWithIssues

**Array of 3 elements**

[0]: string = midserver2
[1]: string = local-midserver
[2]: string = ardis.maison

**Script**: Log Object: MIDUserConnectivity: userIDMostRecentLoginAttemptFailed

**Array of 0 elements**

**Script**: Log Object: MIDUserConnectivity: userIDMostRecentLoginAttemptAuthorizationFailed

**Array of 0 elements**

**Script**: Log Object: MIDUserConnectivity: userIDMostRecentLoginAttemptSuccessful

**Array of 0 elements**

**Script**: Log Object: MIDUserConnectivity: userIDWhereConnectivityNotDetectedByInstance

**Array of 3 elements**

[0]: string = midserver2
[1]: string = local-midserver
[2]: string = ardis.maison

**Script**: Log Object: MIDUserConnectivity: doNotAutoResolveMessages

**Array of 3 elements**

[0]: string = User midserver2 associated with 1 down MID Server. No login attempts within reporting period.
[1]: string = User local-midserver associated with 2 down MID Servers. No login attempts within reporting period.
[2]: string = User ardis.maison with mid_server role not associated with a MID Server. No login attempts within reporting period.

**Script**: MIDUserConnectivity: processing completed
Configuration issues

Any of the following messages can indicate a user configuration issue:

- Login authentication failure for User <user name> with mid_server role not associated with a MID Server.
- Login authorization failure for User <user name> with mid_server role not associated with a MID Server.
- User <user name> with mid_server role successfully connected but not associated with a MID Server. The mid-server role should be reserved for MID Server use only.
- User <user name> with mid_server role is not associated with a MID Server. No login attempts within reporting period.

In this example, a user with the mid_server role has logged in successfully within the configured sampling interval. However, this user is not configured for a MID Server and might have the role in error.

```log
*** Script: Log Object: MIDUserConnectivity: activeUserInWithMIDServerRole
  Array of 3 elements
  [0]: string = admin.example
  [1]: string = midserver
  [2]: string = localhost

*** Script: Log Object: configuredMIDServerUserIDs
  Array of 2 elements
  [0]: string = midserver
  [1]: string = local-midserver

*** Script: Log Object: MIDUserConnectivity: activeUserInWithMIDServerRoleWithNotAssociatedWithConfiguredMIDServer
  Array of 3 elements
  [0]: string = admin.example

*** Script: Log Object: MIDUserConnectivity: userNotAssociatedWithMIDServer
  User with mid_server role is not associated with a MID Server. No login attempts within reporting period.

In this example, a user with the mid_server role has logged in successfully within the configured sampling interval. However, this user is not configured for a MID Server and might have the role in error.

Figure 337: Detailed debugging log for MID Server user account login
```
Orchestration

ServiceNow® Orchestration extends the workflow engine to manage processes and to automate things outside of a ServiceNow instance.

Orchestration is available as a separate subscription from the rest of the ServiceNow platform. See Activate Orchestration on page 1744 for details.

Explore

- Introduction to Orchestration on page 1741
- Orchestration applications on page 1766
- Orchestration ROI on page 1766
- Orchestration examples on page 1819
- Domain separation in Orchestration on page 1744

Set up

- Activate Orchestration on page 1744
- MID Servers for Orchestration on page 2103
- Available activity packs on page 1755
- Setup Client Software Distribution

Administer

- List of Orchestration plugins on page 1745
- Orchestration Runtime plugin on page 1747

Use

- Orchestration activity packs on page 1839
- Password Reset application on page 2110
- Client Software Distribution

Develop

- Orchestration activity designer on page 1990
- Orchestration custom activity templates on page 2027
- Client software distribution extension framework on page 1816
- Developer training

Troubleshoot and get help

- Ask or answer questions in the Orchestration community
- Search the HI knowledge base for known error articles
- Contact ServiceNow Support

Introduction to Orchestration

Orchestration automates simple or complex multi-system tasks on remote services, servers, applications, and hardware.

An Orchestration process can cross all management disciplines and interact with hosted services and all types of infrastructure elements. These capabilities provide a powerful system for managing IT and Business processes quickly and reliably.

Orchestrated solutions aide collaboration among teams by providing reusable data and versioning for both the workflows and the activities within them. Subject matter experts can create activities that are reusable to numerous workflow developers. When an activity requires a change, developers can see the downstream implication of the change immediately by knowing which workflows use the activity. Well-designed orchestrations never fail and apply human tasks to address errors as they arise.

Orchestration tools

Orchestration can make calls outside of a ServiceNow instance, directly to web services or through a MID Server to systems within corporate firewall. Orchestration also enables the creation reusable activities.
that wrapper Java Script functions for manipulating things inside the platform. Orchestration extends the Workflow editor on page 3202 by providing these features:

- **Activity packs** containing ready-to-use activities.
- **Activity Designer**, which enables developers to create custom activities without an over dependence to create scripts to orchestrate to third-party systems.
- Ability to create activity packs using **Scoped Applications**.
- A **Databus** for following the flow of data across orchestration activities.

Orchestration Core provides entitlements to use specific applications:

**Client Software Distribution**

An application that automates software delivery from the Service Catalog. Provides OOB support for SCCM. Partner solutions support Macs using JAMF. Other third-party solutions provide support through the extension framework.

**Password Reset**

An application for users to reset their password in Active Directory. It can expand to communicate with other third-party systems.

**Orchestration ROI**

Enables users to evaluate estimated costs and actual costs for tasks, automate these tasks, and track the ROI of these tasks.

**Systems that Orchestration can automate**

Orchestration can automate tasks such as employee onboarding, user access rights, server management, managed file transfers, and Security Operations Orchestration activities. For example, you might use the Active Directory and Exchange activities provided in the base Orchestration system to set up network accounts and mailboxes for new employees.

If Orchestration does not provide the activities you need for an integration, create the necessary activities using the templates in the **Orchestration Activity Designer**. The external systems that Orchestration can automate for:

- Any system exposing web services (**SOAP, REST**)
- Any system accessible from the command line (such as a UNIX system accessible through **SSH**, a Windows system enabled for **PowerShell** remoting or **WMI**)
- Numerous proprietary services: Windows **Active Directory**, Microsoft **Exchange** mail servers, **InfoBlox**, **F5 Networks**, and **Workday**.

**Note:** For a full list of Activity Pack service offerings, see **Orchestration Core Activity Packs**.

- Any filesystem accessible by **SFTP**
- Any database with a compliant **JDBC** driver
- Additional Activity Packs are also available with other ServiceNow products, such as Security Operations
Orchestration workflow

When an Orchestration activity starts within a workflow, Orchestration launches a probe and writes a probe record to the ECC Queue. The workflow pauses as the MID Server picks up the request and executes the
probe. When the probe reports back, the workflow resumes as the results are analyzed. The workflow can exit or continue at this point.

Figure 339: Orchestration workflow

Orchestration video tutorial

Watch the introductory video for Orchestration.

Domain separation in Orchestration

This is an overview of domain separation and Orchestration. Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.

Overview

Support: Data only

Domain separation in this application is supported at the Data only level, meaning it supports the data security model of separating visibility of data from one domain to another. To learn more, see Application support for domain separation.

Activate Orchestration

The Orchestration (com.snc.runbook_automation) plugin is available as a separate subscription from the rest of the ServiceNow platform.

To purchase a subscription, contact your ServiceNow account manager. The account manager can arrange to have the plugin activated on your organization’s production and sub-production instances, generally within a few days.

If you do not have an account manager, decide to delay activation after purchase, or want to evaluate the product on a sub-production instance without charge, follow these steps.

Role required: none

1. In the HI Service Portal, click Service Requests Activate Plugin.
2. Fill out the form.

<table>
<thead>
<tr>
<th>Target Instance</th>
<th>Instance on which to activate the plugin.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plugin Name</td>
<td>Name of the plugin to activate.</td>
</tr>
</tbody>
</table>
Specify the date and time you would like this plugin to be enabled

| Reason/Comments | Provide any information that would be helpful for the ServiceNow personnel activating the plugin. For example, if you need the plugin activated at a specific time instead of during one of the default activation windows. |

3. Click Submit.

List of Orchestration plugins

This table lists all plugins available for Orchestration and their dependencies.

These Orchestration plugins are available for purchase or can be requested as part of your Orchestration subscription. Contact your account representative for details.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Dependencies</th>
</tr>
</thead>
</table>
| Orchestration [com.snc.runbook_automation] | Main plugin for the Orchestration feature. This plugin extends Workflow to automate operations with external systems. Use this plugin to orchestrate business services, applications, and infrastructure. This plugin automates operations such as deployments, configurations, and information gathering. Orchestration can automate Web Services and uses MID Servers to execute commands on devices inside an enterprise's network. | • Orchestration - ROI  
• Orchestration - Runtime |
| Orchestration - Active Directory [com.snc.orchestration.ad] | Installs the Active Directory activity pack. These activities create, delete, and manage objects in Windows Active Directory. | Orchestration |
| Orchestration - Asset Lease Management [com.snc.orchestration.asset_lease_management] | Provides the software lease functionality for Client Software Distribution. Allows users to select the start and end dates of software leases and to request an extension of a lease. | None |

Note: This plugin is not automatically enabled when Orchestration is active.
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Dependencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orchestration - Azure Active Directory [com.snc.orchestration.azure.ad]</td>
<td>Installs the Azure AD activity pack. These activities automate employee onboarding and offboarding functions on Azure Active Directory and manage Office 365 licensing.</td>
<td>Orchestration</td>
</tr>
<tr>
<td>Orchestration - Client Software Distribution [com.snc.orchestration.client_sf_distribution]</td>
<td>Allows the distribution of software from the service catalog using third party distribution systems, such as Microsoft System Center Configuration Manager (SCCM). <strong>Note:</strong> This plugin is not automatically enabled when Orchestration is active.</td>
<td>• Orchestration - System Center Configuration Manager • Orchestration - Asset Lease Management • Service Catalog Scoped API • Software Asset Management</td>
</tr>
<tr>
<td>Orchestration - Exchange [com.snc.orchestration.exchange]</td>
<td>Installs the Exchange activity pack. These activities manage Microsoft Exchange mail systems.</td>
<td>Orchestration</td>
</tr>
<tr>
<td>Orchestration - F5 network management [com.snc.orchestration.f5]</td>
<td>Installs the F5 Network Management activity pack. These activities configure elements of an F5 load balancer, including pools, pool members, and the virtual servers contained in the pool.</td>
<td>Orchestration</td>
</tr>
<tr>
<td>Orchestration - Infoblox DDI Activity Pack [com.snc.orchestration.infoblox]</td>
<td>Installs the Infoblox DDI activity pack. These activities support Infoblox DDI management.</td>
<td>Orchestration</td>
</tr>
<tr>
<td>Orchestration - PowerShell [com.snc.orchestration.powershell]</td>
<td>Installs the PowerShell activity pack. These activities control and automate the administration of Windows machines and applications, using the Windows .NET Framework.</td>
<td>Orchestration</td>
</tr>
<tr>
<td>Orchestration - Probe [com.snc.orchestration.probe]</td>
<td>Installs the Probe activity pack. These activities run ServiceNow probes on target hosts to return specific information.</td>
<td>Orchestration</td>
</tr>
<tr>
<td>Orchestration - ROI [com.snc.runbook_automation.roi]</td>
<td>Installs an Orchestration application that estimates savings resulting from automated tasks in an instance and computes actual savings. Orchestration - ROI is activated automatically with a base Orchestration subscription.</td>
<td>• Performance Analytics • Cost Management</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
<td>Dependencies</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Orchestration - ROI Premium [com.snc.runbook_automation.roi_premium]</td>
<td>Installs a premium dashboard that displays detailed reports on calculated savings for automated tasks over time. The Orchestration - ROI Premium plugin requires purchase and activation of the Performance Analytics - Premium plugin to display its reports.</td>
<td>• Orchestration - ROI&lt;br&gt;• Performance Analytics - Premium</td>
</tr>
<tr>
<td>Orchestration - Runtime [com.snc.runbook_automation.runtime]</td>
<td>Enables other applications on the ServiceNow® platform to distribute and use orchestration content without requiring an Orchestration subscription. The Orchestration - Runtime plugin displays the Orchestration activities shipped with these applications in the Workflow Editor and allows customers to modify the activities without requiring an Orchestration license.</td>
<td>• Workflow Runtime Engine&lt;br&gt;• Core Automation</td>
</tr>
<tr>
<td>Orchestration - SFTP [com.snc.orchestration.sftp]</td>
<td>Installs the SFTP File Transfer activity pack. These activities manage files and directories on an SFTP server and move files from one SFTP server to another.</td>
<td>Orchestration</td>
</tr>
<tr>
<td>Orchestration - SSH [com.snc.orchestration.ssh]</td>
<td>Installs the SSH activity pack. These activities read, write, and copy files, and reset user passwords on Linux computers.</td>
<td>Orchestration</td>
</tr>
<tr>
<td>Orchestration - System Center Configuration Manager [com.snc.orchestration.sccm_mgmt]</td>
<td>Installs the System Center Configuration Manager (SCCM) activity pack. These activities manage software deployments and collections on an SCCM server.</td>
<td>Orchestration</td>
</tr>
<tr>
<td>Orchestration - Workday [com.snc.orchestration.workday]</td>
<td>Installs the Workday Orchestration activity pack. These activities change and return employee information from Workday.</td>
<td>Orchestration</td>
</tr>
</tbody>
</table>

**Orchestration Runtime plugin**

The Orchestration – Runtime plugin enables other applications on the ServiceNow® platform to automate tasks, without requiring an Orchestration subscription.

The Orchestration – Runtime plugin can be activated as part of another plugin or application. It is used by strategic technology partners and ServiceNow applications to distribute activity packs to customers who may not own Orchestration. For example, the Security Incident Response Management (SIRM) application provides orchestration content, which includes activities that are available from the Packs tab in the Workflow Editor. Customers who purchase SIRM can consume and modify the activities that SIRM ships without having to purchase an Orchestration license.
Included with the plugin

The Orchestration – Runtime plugin provides access to the Packs and Data tabs in the Workflow Editor. This plugin gives users access to custom activities for their applications and enables them to reuse data from the Databus. This plugin does not provide access to custom Orchestration activity packs or to the activity designer. The Custom tab in the Workflow Editor is not available without an Orchestration subscription.

Figure 340: Orchestration plugin relationships

Dependencies

The Orchestration – Runtime plugin activates these application plugins:

• Security Incident Response Orchestration
• Service Release Automation
**Access to activities**

Custom activities shipped with ServiceNow® applications are available in the Packs tab of the Workflow Editor for use in workflows. To edit these activities, navigate to Orchestration Activity Designer Activities and select the activity you want to modify. For information about the provider templates used to create these activities, see *Orchestration custom activity templates* on page 2027.

**List of Orchestration activities**

Use Orchestration activities in a Workflow to integrate with third-party systems.

Several Orchestration activities have been rewritten as *scoped* activities using the *activity designer* and grouped into *activity packs*. Other non-scoped activities are deprecated and may or may not appear in the Workflow Editor. However, all deprecated activities still function in existing workflows that use them.

**Global activities**

These activities run in the global scope only. Any activities you create in the global scope are organized in the Global category in the Packs and Custom tabs in the Workflow Editor.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Server Alive</td>
<td>Runs a command (including shell scripts) on a Linux or UNIX computer via SSH to validate whether the target system is alive.</td>
</tr>
</tbody>
</table>

**Active Directory (AD) activities**

All AD Orchestration activities were rewritten in the Geneva release as scoped activities and are available in the Active Directory activity pack. All previous version AD activities that were built on activity definitions are deprecated and are unavailable for use in new workflows.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create AD Object</td>
<td>Creates a user account in Windows Active Directory when a user account is created in a ServiceNow instance.</td>
</tr>
<tr>
<td>Disable AD User Account</td>
<td>Marks a Windows Active Directory user account disabled, making it inactive.</td>
</tr>
<tr>
<td>Enable AD User Account</td>
<td>Enables a Windows Active Directory user account, making it active.</td>
</tr>
<tr>
<td>Query AD</td>
<td>Retrieves entries from the Windows Active Directory based on a search filter.</td>
</tr>
<tr>
<td>Remove AD Object</td>
<td>Deletes a user account from Windows Active Directory.</td>
</tr>
<tr>
<td>Reset AD User Password</td>
<td>Resets the password of a user account in Windows Active Directory.</td>
</tr>
<tr>
<td>Change AD User Password</td>
<td>Changes the password of a user account in Windows Active Directory.</td>
</tr>
<tr>
<td>Activity</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Update AD Object</td>
<td>Updates a user account in Windows Active Directory.</td>
</tr>
<tr>
<td>Is AD Account Locked</td>
<td>Determines if an Active Directory user account is locked.</td>
</tr>
<tr>
<td>Unlock AD Account</td>
<td>Unlocks a locked Active Directory user account.</td>
</tr>
</tbody>
</table>

**Azure AD**

All these activities are scoped and part of the Azure AD activity pack. They do not have legacy versions.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add User to Group</td>
<td>Adds a user to an existing security group in Azure Active Directory.</td>
</tr>
<tr>
<td>Assign User License</td>
<td>Assigns an extra Office 365 software license to the named user.</td>
</tr>
<tr>
<td>Create User</td>
<td>Creates a user for the Azure Active Directory tenant.</td>
</tr>
<tr>
<td>Delete User</td>
<td>Deletes the named user's account from the Azure Active Directory tenant.</td>
</tr>
<tr>
<td>Get User Info</td>
<td>Returns the named user's information from the Azure Active Directory.</td>
</tr>
<tr>
<td>Remove User from Group</td>
<td>Removes an existing user from a security group in Azure Active Directory.</td>
</tr>
<tr>
<td>Remove User License</td>
<td>Revokes the specified Office 365 software license for the named user.</td>
</tr>
<tr>
<td>Reset User Password</td>
<td>Changes the named user's Azure Active Directory password.</td>
</tr>
</tbody>
</table>

**F5 Network Management activities**

All these activities are scoped and part of the F5 Network Management activity pack. They do not have legacy versions.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add F5 Pool</td>
<td>Creates the load balancer pool.</td>
</tr>
<tr>
<td>Check F5 Pool</td>
<td>Checks the status of a pool to validate whether it is available to accept traffic.</td>
</tr>
<tr>
<td>Delete F5 Pool</td>
<td>Deletes an F5 pool.</td>
</tr>
<tr>
<td>Add F5 Pool Member</td>
<td>Adds a member to an F5 pool.</td>
</tr>
<tr>
<td>Get F5 Pool Member</td>
<td>Returns the pool members and verifies the pool status.</td>
</tr>
<tr>
<td>Delete F5 Pool Member</td>
<td>Deletes an F5 pool member.</td>
</tr>
<tr>
<td>Activity</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Add F5 Virtual Server</td>
<td>Adds a virtual server.</td>
</tr>
<tr>
<td>Modify F5 Virtual Server</td>
<td>Configures a virtual server assigned to an F5 pool with irules and a vlan.</td>
</tr>
<tr>
<td>Delete F5 Virtual Server</td>
<td>Deletes a virtual server from an F5 pool.</td>
</tr>
<tr>
<td>Add F5 Profile to Virtual Server</td>
<td>Adds a profile to a virtual server assigned to an F5 pool.</td>
</tr>
</tbody>
</table>

**Infoblox activities**

All these activities are scoped and part of the Infoblox DDI activity pack. They do not have legacy versions.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DHCP Reserve IP v4 Address Range</td>
<td>Reserves an IP address range for DHCP use.</td>
</tr>
<tr>
<td>DHCP Delete IP Reservation</td>
<td>Deletes IP reservations in DHCP using either an IPv4 or IPv6 address range.</td>
</tr>
<tr>
<td>DHCP List IP Reservations</td>
<td>Generates a list of all the DHCP range reservations on a specific Infoblox server.</td>
</tr>
<tr>
<td>List DNS C-records</td>
<td>Retrieves all canonical (CNAME) records from a specified Infoblox server.</td>
</tr>
<tr>
<td>Register DNS A-record</td>
<td>Creates a DNS A record on a specified Infoblox server.</td>
</tr>
<tr>
<td>Register DNS C-Record</td>
<td>Creates a DNS canonical (CNAME) record on a specified Infoblox server.</td>
</tr>
<tr>
<td>List DNS Record</td>
<td>Generates a list of all the DNS entries on a specific Infoblox server.</td>
</tr>
<tr>
<td>DNS Delete</td>
<td>Deletes DNS records of any type from in Infoblox server, such as C and A records.</td>
</tr>
<tr>
<td>IPAM Register IP Address</td>
<td>Registers an IP address in a network using Infoblox IPAM.</td>
</tr>
<tr>
<td>IPAM Reserve IP Address</td>
<td>Reserves an IP address in a network using Infoblox IPAM.</td>
</tr>
<tr>
<td>IPAM List IP Reservations</td>
<td>Returns an array of all IP Address within the named Infoblox Server.</td>
</tr>
<tr>
<td>IPAM Delete</td>
<td>Deletes an IP Address within a named Infoblox server.</td>
</tr>
<tr>
<td>Create Network</td>
<td>Creates networks on a specified Infoblox server.</td>
</tr>
<tr>
<td>Get Network Details</td>
<td>Retrieves the information about a specific network on an Infoblox server.</td>
</tr>
<tr>
<td>Delete Network</td>
<td>Deletes a network from an Infoblox server.</td>
</tr>
<tr>
<td>List Registered Networks</td>
<td>Retrieves all the networks associated with an Infoblox server.</td>
</tr>
</tbody>
</table>
Microsoft Exchange activities

All Exchange Orchestration activities were rewritten in the Geneva release as scoped activities and are available in the Exchange activity pack. All previous version Exchange activities that were built on activity definitions are deprecated and are unavailable for use in new workflows.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create Address List</td>
<td>Creates an address list that acts as an alias for emailing all users in the group. This alias cannot be used to manage user permissions.</td>
</tr>
<tr>
<td>Delete Address List</td>
<td>Removes an existing address list from an Exchange server.</td>
</tr>
<tr>
<td>Get Address List</td>
<td>Retrieves all attributes from the specified Exchange address list.</td>
</tr>
<tr>
<td>Move Address List</td>
<td>Moves an Exchange address list to another location in the address hierarchy.</td>
</tr>
<tr>
<td>Set Address List</td>
<td>Modifies an Exchange address list.</td>
</tr>
<tr>
<td>Update Address List</td>
<td>Adds or removes users from the specified address list and immediately applies any cached address list changes to the server.</td>
</tr>
<tr>
<td>Create Mailbox</td>
<td>If a user does not exist, creates a new Active Directory user and associated Exchange mailbox.</td>
</tr>
<tr>
<td>Delete Mailbox</td>
<td>Deletes the Exchange mailbox of an Active Directory user.</td>
</tr>
<tr>
<td>Disable Mailbox</td>
<td>Disables the mailbox associated with a specified Active Directory account.</td>
</tr>
<tr>
<td>Enable Mailbox</td>
<td>Creates a mailbox for an existing Active Directory user.</td>
</tr>
<tr>
<td>Get Mailbox</td>
<td>Gets the mailbox for the specified user or all mailboxes on an Exchange server.</td>
</tr>
<tr>
<td>Set Mailbox</td>
<td>Modifies the settings of an existing Exchange mailbox.</td>
</tr>
</tbody>
</table>

PowerShell activities

These PowerShell activities were rewritten as scoped activities and are available in the PowerShell activity pack. All previous version PowerShell activities that were built on activity definitions are deprecated and are unavailable for use in new workflows.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Install Windows App</td>
<td>Installs an application on a Windows target machine.</td>
</tr>
<tr>
<td>Join Domain</td>
<td>Joins a Windows machine to a domain.</td>
</tr>
<tr>
<td>Activity</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Uninstall Windows App</td>
<td>Uninstalls an application from a Windows target machine.</td>
</tr>
<tr>
<td>Change Service State</td>
<td>Starts or stops a Windows service on a remote system.</td>
</tr>
</tbody>
</table>

**Probe activities**

These probe activities were rewritten as scoped activities and are available in the Probe activity pack. All previous versions of these activities that were built on activity definitions are deprecated and are unavailable for use in new workflows.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolve DNS Name</td>
<td>Resolves an IP address or a fully qualified domain name (FQDN) into one or more IP addresses.</td>
</tr>
<tr>
<td>SNMP Query</td>
<td>Queries an SNMP device.</td>
</tr>
</tbody>
</table>

**SCCM activities**

All these activities are scoped and part of the SCCM activity pack. They do not have legacy versions.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add to Device Collection</td>
<td>Adds a device to a Microsoft System Center Configuration Manager (SCCM) device collection.</td>
</tr>
<tr>
<td>Add to User Collection</td>
<td>Adds a user to a Microsoft System Center Configuration Manager (SCCM) user collection.</td>
</tr>
<tr>
<td>Get Applications</td>
<td>Returns a list of all the applications available on a Microsoft System Center Configuration Manager (SCCM) server.</td>
</tr>
<tr>
<td>Get Deployments</td>
<td>Returns the list of deployments performed by Orchestration using a Microsoft System Center Configuration Manager (SCCM) server.</td>
</tr>
<tr>
<td>Get Device Collections</td>
<td>Returns the list of available device collections on a Microsoft System Center Configuration Manager (SCCM) host.</td>
</tr>
<tr>
<td>Get User Collections</td>
<td>Returns the list of available user collections on a Microsoft System Center Configuration Manager (SCCM) host.</td>
</tr>
<tr>
<td>Remove from Device Collection</td>
<td>Removes a device from a Microsoft System Center Configuration Manager (SCCM) device collection.</td>
</tr>
<tr>
<td>Remove from User Collection</td>
<td>Removes a user from a Microsoft System Center Configuration Manager (SCCM) user collection.</td>
</tr>
</tbody>
</table>
SSH activities

These SSH activities were rewritten as scoped activities and are available in the SSH activity pack. The SSH activities not converted to scoped activities were moved to the Orchestration - Deprecated category, but are still available for all workflows.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>File Copy</td>
<td>Copies a file on a Linux or Unix computer, via SSH.</td>
</tr>
<tr>
<td>File Read</td>
<td>Reads a file on a Linux or Unix computer, via SSH.</td>
</tr>
<tr>
<td>File Write</td>
<td>Writes a file on a Linux or UNIX computer.</td>
</tr>
<tr>
<td>File Replace String</td>
<td>Finds and replaces a string in a file on a Linux or UNIX computer.</td>
</tr>
<tr>
<td>Files Compare</td>
<td>Compares two files on a Linux or Unix computer, via SSH.</td>
</tr>
<tr>
<td>Reset Linux User Password</td>
<td>Resets the password for a given user on a Linux computer.</td>
</tr>
<tr>
<td>Secure Copy</td>
<td>Copies a file from one host to another, without storing the copied file on the MID Server.</td>
</tr>
</tbody>
</table>

SFTP activities

All these activities are scoped and part of the SFTP File Transfer activity pack. They do not have legacy versions.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copy File</td>
<td>Copies a file from an SFTP server (source host) to another SFTP server (target host).</td>
</tr>
<tr>
<td>Create Directory</td>
<td>Creates a directory on an SFTP server.</td>
</tr>
<tr>
<td>Get File List</td>
<td>Returns a list of files from a given directory and its subdirectories on an SFTP server (source host).</td>
</tr>
<tr>
<td>Remove File or Directory</td>
<td>Removes a file or a directory on an SFTP server, including subdirectories, when configured.</td>
</tr>
<tr>
<td>Rename File or Directory</td>
<td>Renames a file or directory to a new name on an SFTP server.</td>
</tr>
<tr>
<td>Set File Attributes</td>
<td>Sets common file attributes, such as timestamps, size, permissions, and UID/GID, for a file or directory on an SFTP server.</td>
</tr>
</tbody>
</table>
Workday activities

All these activities are scoped and part of the Workday Orchestration activity pack. They do not have legacy versions.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Get Employee Info</td>
<td>Gets employee information from Workday.</td>
</tr>
<tr>
<td>Update Employee Contact</td>
<td>Updates employee contact information in Workday.</td>
</tr>
<tr>
<td>Update Employee Work Email</td>
<td>Updates employee work email address in Workday.</td>
</tr>
</tbody>
</table>

GlideActions

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check User Exists</td>
<td>Checks the ServiceNow sys_user table to validate whether a record exists for a new employee named in a Workday onboarding notification.</td>
</tr>
<tr>
<td>Create User in Users Table</td>
<td>Uses the employee information returned from Workday to create a user record in the ServiceNow sys_user table.</td>
</tr>
<tr>
<td>Update User in Users Table</td>
<td>Uses the employee information returned from Workday to update an existing user record in the ServiceNow sys_user table.</td>
</tr>
</tbody>
</table>

Deprecated activities

These activities have been removed from the Workflow Editor and are not available for new workflows, but continue to work normally in existing workflows. You can reactivate the deprecated activity or duplicate the functionality of a deprecated activity as a scoped activity by recreating it using the activity designer.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Run Probe</td>
<td>Launches a MID Server probe on behalf of a document.</td>
</tr>
<tr>
<td>SOAP Request</td>
<td>Executes a SOAP request on a target server. The SOAP Message activity replaces this activity.</td>
</tr>
<tr>
<td>Run Command</td>
<td>Runs a command (including shell scripts) on a Linux or UNIX computer.</td>
</tr>
<tr>
<td>Run SCP</td>
<td>Uses Secure Copy Protocol (SCP) to copy a file from one computer to another, including the directory in which the file resides. The Secure Copy activity replaces the Run SCP activity.</td>
</tr>
<tr>
<td>Run Powershell</td>
<td>Executes Windows PowerShell commands on a MID Server.</td>
</tr>
</tbody>
</table>

Available activity packs

Activity packs are available with your subscription to Orchestration.

Role required: admin

The following activity packs are available and active with your Orchestration subscription:
- **Orchestration - Active Directory** (com.snc.orchestration.ad)
- **Orchestration - Azure Active Directory** (com.snc.orchestration.azure.ad)
- **Orchestration - Exchange** (com.snc.orchestration.exchange)
- **Orchestration - SFTP** (com.snc.orchestration.sftp)
- **Orchestration - Infoblox DDI Activity Pack** (com.snc.orchestration.infoblox)
- **F5 Network Management activity pack** on page 1886 (com.snc.orchestration.f5)
- **Orchestration - SSH** (com.snc.orchestration.ssh)
- **Orchestration - PowerShell** (com.snc.orchestration.powershell)
- **Orchestration - System Center Configuration Manager** (com.snc.orchestration.sccm_mgnt)

1. In the HI Service Portal, click **Service Requests Activate Plugin**.
2. Fill out the form.

<table>
<thead>
<tr>
<th>Target Instance</th>
<th>Instance on which to activate the plugin.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plugin Name</td>
<td>Name of the plugin to activate.</td>
</tr>
<tr>
<td>Specify the date and time you would like this plugin to be enabled</td>
<td>Date and time must be at least 2 business days from the current time. <strong>Note:</strong> Plugins are activated in two batches each business day in the Pacific time zone, once in the morning and once in the evening. If the plugin must be activated at a specific time, enter the request in the Reason/Comments.</td>
</tr>
<tr>
<td>Reason/Comments</td>
<td>Provide any information that would be helpful for the ServiceNow personnel activating the plugin. For example, if you need the plugin activated at a specific time instead of during one of the default activation windows.</td>
</tr>
</tbody>
</table>

3. Click Submit.

**Deprecated Orchestration activities**

These Orchestration activities have been deprecated.

**Run Probe**

The Run Probe activity launches a MID Server probe on behalf of a document. All Orchestration activities that launch a probe on a target machine are based on the Run Probe activity. Your ServiceNow instance must have access to a MID Server configured to use SSH to run this activity.

**Attention:** This activity is deprecated and is unavailable for new workflows. To replace the functionality of this probe, use the **Probe activity template** to create a custom activity. Workflows from a previous release that use the Run Probe activity can continue to do so.
Table 636: Run Probe input variables

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probe</td>
<td>Select a MID Server probe from the list. This is the name of the probe as it appears in the discovery_probes table.</td>
</tr>
<tr>
<td>Source for probe</td>
<td>Enter the IP address of the host system against which the probe runs (the probe’s target).</td>
</tr>
<tr>
<td>Sensor script</td>
<td>The script to run using the results of the probe. The output from the probe is contained in a variable called output. Any error from the probe is contained in a variable called error.</td>
</tr>
</tbody>
</table>

**SOAP Request**

The SOAP Request activity executes a SOAP request on a target server.

**Attention:** This activity is deprecated and is replaced by the *SOAP Message workflow activity* on page 1758 activity. Workflows from a previous release that use the SOAP Request activity can continue to do so. However, this activity is not available for new workflows.

Table 637: SOAP Request input variables

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOAP URL</td>
<td>The SOAP endpoint.</td>
</tr>
<tr>
<td>Username</td>
<td>User name for basic authentication credentials.</td>
</tr>
<tr>
<td>Password</td>
<td>Password for basic authentication credentials.</td>
</tr>
<tr>
<td>Envelope Script</td>
<td>Script for setting up parameters for the web service.</td>
</tr>
<tr>
<td>Sensor Script</td>
<td>The script to execute after the request has been made and a response has been received.</td>
</tr>
</tbody>
</table>

**Reactivate a deprecated activity**

Orchestration activities that were converted to activity packs are deprecated for upgraded and new instances but can be reactivated for use in new workflows.

Role required: workflow_admin, admin

**Note:** Reactivation of deprecated activities for use in new workflows is discouraged. Legacy activities cannot use the unique features of the scoped applications, such as reuse of data from the databus and input variable testing.

1. Navigate to Workflow Administration Activity Definitions.
2. In the list of activities, clear the condition Category !=deprecated from the filter.
3. Open the definition record for the activity you want to reactivate.
4. Select the What to Display tab.
5. In the Category field, replace the value deprecated with another category.
   This can be an arbitrary string.
6. Click Update.
   The system creates a new category using the value provided and reactivates the activity, which becomes available in the Core tab of the Workflow Editor.

SOAP Message workflow activity

The SOAP Message activity uses SOAP messages defined in the System Web Services plugin and can call the messages using a MID Server.

Your instance must have access to a MID Server configured to use SOAP.

Input variables

Table 638: SOAP Message activity input variables

<table>
<thead>
<tr>
<th>Field</th>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOAP Message</td>
<td>soap_message</td>
<td>The SOAP Message defined under the System Web Services plugin's Outbound SOAP Message [sys_soap_message] table. ( System Web Services Outbound SOAP Message )</td>
</tr>
<tr>
<td>SOAP Message Function</td>
<td>soap_message_function</td>
<td>The function to call that is defined in the SOAP Message. Functions are listed in the SOAP Message Functions related list in each SOAP Message record.</td>
</tr>
<tr>
<td>SOAP Endpoint</td>
<td>soap_endpoint</td>
<td>Endpoint to use instead of the SOAP endpoint value in the SOAP Message Function record. Leave this field blank to use the defined endpoint in the SOAP Message Function record.</td>
</tr>
<tr>
<td>Field</td>
<td>Parameter</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Variables           | variables         | Variables to substitute into the SOAP Envelope defined in the SOAP Message Function record. Use this format for the string:  

```
name1=value1,
name2=value2, ...
```

If either the name or value contains a comma or equal sign, escape these characters with a backslash.  

<table>
<thead>
<tr>
<th>Use MID Server</th>
<th>use_midserver</th>
<th>Check box for using a MID Server to send the SOAP message. A MID Server might be necessary to reach an endpoint within a firewall or a sub-network that is not visible from the instance. If this check box is selected (true), but no MID Server is defined in the MID Server field, workflow automatically attempts to find a MID Server.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MID Server</td>
<td>midserver</td>
<td>Name of the MID Server to use. This field appears when you select the Use MID Server check box. The workflow ignores this parameter if the use_midserver parameter is disabled.</td>
</tr>
<tr>
<td>Sensor Script</td>
<td>sensor_script</td>
<td>The script to execute after the request has been made and a response has been received. You can access the full XML response body from the activity.output object.</td>
</tr>
</tbody>
</table>

**Note:** You can only select a specific MID Server in the legacy SOAP message activity and REST messages. These legacy activities do not use the MID Server selection criteria available starting with the Istanbul release.
Probes used by Orchestration

Certain probes, controlled by MID Servers, perform Orchestration tasks on remote computers, such as restarting a server or creating virtual machines from templates.

How Orchestration probes work

When a Workflow executes an Orchestration activity, that activity launches a probe, which writes an output record to the ECC Queue. The MID Server selected for the activity checks the ECC Queue for assignments, and then executes the appropriate probe to do the work on the target machine. The information about the activity (machine restarted, files copied, etc.) that is returned from the target machine by the probe is written to the ECC Queue as an input record. This information is then sent from the ECC Queue to a sensor that is built into the Workflow activity. The Workflow is updated, and the next activity is executed.

Note: The probe parameters are set by the activities that launch the probe.

Figure 341: How Orchestration uses probes

Probe List

The base system includes the following Orchestration probes (Orchestration Definition Probes).

Table 639: Probe List

<table>
<thead>
<tr>
<th>Probe Name</th>
<th>ECC Queue Topic</th>
<th>ECC Queue Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command</td>
<td>Command</td>
<td></td>
<td>A probe that runs a local command on the MID server.</td>
</tr>
<tr>
<td>DNS Name Resolver</td>
<td>DNSNameResolver</td>
<td></td>
<td>A probe that resolves a fully qualified domain name (FQDN) into an IP address</td>
</tr>
<tr>
<td>Probe Name</td>
<td>ECC Queue Topic</td>
<td>ECC Queue Name</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------</td>
<td>----------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>SCPCommand</td>
<td>SCPCommand</td>
<td></td>
<td>A probe that copies files securely from one machine to another. The copy function is performed using the MID Server as a tunnel.</td>
</tr>
<tr>
<td>Shazzam</td>
<td>Shazzam</td>
<td></td>
<td>A probe that identifies active devices.</td>
</tr>
<tr>
<td>SNMPProbe</td>
<td>SNMP</td>
<td>SNMP Query</td>
<td>This is a generic SNMP probe.</td>
</tr>
<tr>
<td>SOAPProbe</td>
<td>SOAPProbe</td>
<td></td>
<td>A probe that sends a SOAP request to target machine.</td>
</tr>
<tr>
<td>SSHCommand</td>
<td>SSHCommand</td>
<td></td>
<td>A probe that executes shell scripts from a command line after logging in to a target machine via SSH.</td>
</tr>
<tr>
<td>SSHCommandLong</td>
<td>SSHCommandLong</td>
<td></td>
<td>A probe that executes long running shell scripts from a command line after logging in to a target machine via SSH.</td>
</tr>
<tr>
<td>VMWare</td>
<td>VMWareProbe</td>
<td></td>
<td>A generic VMware probe that executes the MID Server script include in the ECC queue name that is set by a VMware Orchestration activity. This probe can run any MID Server script include.</td>
</tr>
<tr>
<td>Probe Name</td>
<td>ECC Queue Topic</td>
<td>ECC Queue Name</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------------</td>
<td>---------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Windows - PowerShell | PowerShell     | Windows - PowerShell | A probe that runs a Windows PowerShell script on the MID Server. The PowerShell script is provided as the value of a parameter with name ending in .ps1. Two variables are available to the script:  
• $computer: The computer pointed to as the source for this probe  
• $cred: A PowerShell credential, using a user name and password from the Credentials table, that logs into $computer successfully. |

**PowerShell activities**

PowerShell is built on the Windows .NET Framework and is designed to control and automate the administration of Windows machines and applications.

PowerShell must be installed on any MID Server that uses these activities. MID Servers using PowerShell must be installed on a supported Windows operating system. ServiceNow supports PowerShell 2.0 and above. PowerShell 3.0 does not support Windows 2003 Server.

The ServiceNow Orchestration plugin adds these basic PowerShell activities to workflows. For instructions on using activities from the PowerShell activity pack, see PowerShell activity pack on page 1922

*Legacy Run PowerShell activity*

The Run PowerShell activity executes Windows PowerShell commands on a MID Server.

**Attention:** This activity is deprecated and is unavailable for new workflows. To replace the functionality of this activity, use the Powershell activity template to create a custom, scoped activity. Workflows from a previous release that use the Run PowerShell activity can continue to do so.

**Result Values**

The workflow designer can assign a result value using activity.result from within a script field of the activity. By default, the success or failure of the PowerShell commands used determines the result value of the Run PowerShell activity. Possible result values are:

• Success
• Failure
**Scratchpad Entries**

Information written to stdout by the executing script is captured and returned to the activity in the `activity.output` variable. This information can be parsed, processed, or saved (to a scratchpad variable, for example) for future processing in the activity’s sensor script.

An example would be to run the `get-date` command to get the MID Server’s current time. This sensor script saves the full output received, but we can process it to return and save only the time.

![Figure 342: PowerShell activity](image)

**Note:** This is an over-simplified example. In most cases, the script operates against some remote Windows computer. However, the principal is the same – whatever is written to stdout is returned in `activity.output` and available to process.

**Input Variables**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hostname</td>
<td>IP address of the target Windows machine. This value is mapped to the <code>$computer</code> variable for use in commands (see the example in the Command field). A PowerShell credential variable called <code>$cred</code> that is based on information in the ServiceNow Credentials table will authenticate on the computer pointed to by Hostname.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Command               | Enter the PowerShell command to run. For example, to execute a simple WMI query against a remote machine pointed to by the hostname variable, the command is:  
  ```powershell
  get-wmiobject <class> -computer $computer -credential $cred
  ```  
  If no credentials authenticate on the computer, the command runs in the context of the MID Server user.  
  You cannot run both a command and a script file. Specifying a command hides the Script file variable. |
| Sensor script         | The script to run using the results of the probe. The output from the probe is contained in a variable called output. Any error from the probe is contained in a variable called error. |
| Script file           | The MID Server script file to run. You cannot run both a script file and a command. Selecting a script file hides the Command variable.          |
| PowerShell script variables | Additional parameters, in JSON format, used by the specified script file.                                                                 |

**States**

The activity state tells the workflow engine what to do with the activity.

**Table 641: States**

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executing</td>
<td>The workflow engine knows to start the onExecute function of the activity.</td>
</tr>
<tr>
<td>Finished</td>
<td>The activity finished running. See the result value for the outcome of the activity.</td>
</tr>
<tr>
<td>Cancelled</td>
<td>This activity, or the workflow that contains this activity, was cancelled.</td>
</tr>
</tbody>
</table>

Add workflow variables for the command line using the normal workflow variable syntax. In the example above, if the `<class>` was in a workflow input variable called myclass, the command would look like:

```powershell
get-wmiobject ${workflow.inputs.myclass} -computer $computer -credential $cred
```

Similarly, if the variable is a scratchpad variable named `myclass`, the command would look like:

```powershell
get-wmiobject $ {workflow.inputs.myclass } -computer $computer -credential $cred
```
get -wmiobject ${workflow.scratchpad.myclass} -computer $computer -credential $cred

**HResult codes**

When a PowerShell script encounters an error, the Windows machine may return an HResult code as part of the error message.

PowerShell activities can read and interpret this code. Not all PowerShell errors include an HResult code. In the event of a failed PowerShell script, you can use the HResult code to move the workflow through a specific condition.

For example, when resetting an Active Directory password to a password that does not meet policy requirements, such as minimum length or complexity, the PowerShell script returns the HResult code -2146022651. To use this code, create an activity condition with the Condition value of activity.hresult = -2146022651. If the PowerShell script returns this code when the activity runs, the workflow transitions through this new condition.

**SSH activities**

SSH activities allow workflows to perform operations on Linux and Unix computers.

Your ServiceNow instance must have access to a MID Server configured to use SSH to run these Orchestration activities.

**Run Command activity**

The Run Command activity runs a command (including shell scripts) on a Linux or UNIX computer.

---

**Attention:** The Run Command activity is deprecated in this release. If you have a workflow created in a previous version that uses this activity, your workflow will continue to work normally after upgrading to Helsinki. However, to use this functionality in a new workflow, you must create a custom activity using the **SSH activity template** in the ServiceNow® activity designer.

**Input variables**

**Table 642: Run command input variables**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long running</td>
<td>Select this check box to disable the SSH connection timeout if you think the command will take longer to run than the default 60 seconds. Orchestration periodically checks the running process to determine its status until it is finished.</td>
</tr>
<tr>
<td>Hostname</td>
<td>Hostname or IP address of destination server for SSH activity.</td>
</tr>
<tr>
<td>Directory</td>
<td>Name of the working directory.</td>
</tr>
<tr>
<td>Command</td>
<td>The command to run from this activity.</td>
</tr>
<tr>
<td>Sudo</td>
<td>Select this check box to use <code>sudo</code> to run the command on the host machine.</td>
</tr>
</tbody>
</table>
Run SCP activity
The Run SCP activity uses Secure Copy Protocol (SCP) to copy a file from one computer to another, including the directory in which the file resides.

**Note:** This activity is deprecated in the Geneva release and is not available for use in new workflows. If you have a workflow created in a previous version that uses this activity, your workflow will continue to work normally after upgrading. The custom Secure Copy activity on page 1972 replaces the Run SCP activity in the Geneva release.

Input variables

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>From Host</td>
<td>Hostname or IP address of the source computer.</td>
</tr>
<tr>
<td>From File</td>
<td>Absolute path to the file to copy. This value can be a directory.</td>
</tr>
<tr>
<td>To Host</td>
<td>Hostname or IP address of the target computer.</td>
</tr>
<tr>
<td>To File</td>
<td>Path to the target file. This path can be absolute or relative to the logged in user's home directory. The specified directory must already exist on the target computer.</td>
</tr>
<tr>
<td>Copy Directory</td>
<td>Check box to copy a directory defined in the From File variable and all files contained in that directory.</td>
</tr>
</tbody>
</table>

Orchestration applications
Orchestration provides several applications with your subscription.

Orchestration ROI
The Orchestration ROI application allows you to estimate and compute cost savings for tasks in your system that could be automated with Orchestration.

After you automate the tasks, you can track cost savings by associating Orchestration workflows with corresponding task areas. Configuration in the application allows you to select the hourly rate for performing the task manually, the rules the system uses to select tasks for evaluation, and the time period of the evaluation. Orchestration ROI estimates your savings by multiplying the cost of performing repetitive tasks manually by the estimated number of times the system performs those tasks automatically during a
specific date/time range. The system also calculates the actual savings of your automations. Orchestration ROI is included with the base Orchestration subscription.

Orchestration ROI reports offer a number of views of the comparative data and allow you to access the associated records directly from the reports. The standard reports included with the Orchestration - ROI plugin provide summaries, estimated costs, and calculated costs for automated processes. The ROI premium dashboard uses Performance Analytics to provide detailed reports on calculated savings over time. Performance Analytics requires a different plugin and subscription.

**Note:** When Orchestration ROI is activated as a dependent plugin of Orchestration, demo data is not installed. If you want to use demo data as a template for your own ROI evaluation, submit a request to ServiceNow® technical support for an Orchestration ROI plugin upgrade with demo data selected.

To set up Orchestration ROI, complete the configuration tasks in the order shown here.

### Create Orchestration ROI labor rate cards

Before calculating your Orchestration ROI, you must create labor rate cards for the manual work that would be required to complete the tasks correlated to the ROI calculations.

Role required: orchestration_manager

The hourly rates defined in the rate cards are used to determine the savings from your orchestrated tasks.

1. Navigate to Orchestration ROI Labor Rate Cards.
2. Complete the fields in the form using the descriptions in Manage a labor rate card.
3. Click Submit.
4. Create additional rate cards as needed.

### Create an Orchestration ROI automation entry record

The ROI automation entry record couples the cost of performing a task with the specific workflow that automates the task, for the purpose of calculating the resulting savings.

Role required: orchestration_manager

Before starting this procedure, verify that the appropriate labor rate cards were created.

Use this record to apply a manual hourly rate to a task that is performed automatically by your instance. To determine the savings realized from orchestrating a task, the system can evaluate whether those savings were estimated or calculated.

- **Estimated savings:** Uses the labor rate, the time estimates for completion of the task, and the number of automations that have been run to determine savings.
- **Calculated savings:** Uses the labor rate, the time calculated for completion of the task, based on the configured evaluation period, and the number of automations that have been run to determine savings.

1. Navigate to Orchestration ROI Automation Entry Form.
2. Fill in the fields on the form, as appropriate.
Table 644: Automation Entry Form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
<td>Category of the selected workflow automation. The following categories are provided in the base Orchestration - ROI system:</td>
</tr>
<tr>
<td></td>
<td>• Access &amp; Identity Management</td>
</tr>
<tr>
<td></td>
<td>• Datacenter Automation</td>
</tr>
<tr>
<td></td>
<td>• IT Service Management</td>
</tr>
<tr>
<td></td>
<td>• Other</td>
</tr>
</tbody>
</table>

**Note:** To create a category, open the dictionary record for the Automation Entry Form [automation_entry_form] table and add an option to the choice list.

<table>
<thead>
<tr>
<th>Item</th>
<th>Unique name for the specific task within the category. This value represents the work to which the labor rate card applies, such as Password Reset.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource</td>
<td>Labor rate card to apply to this automation entry. You must have IT Cost Management active on the instance for this field to appear.</td>
</tr>
<tr>
<td>Associated Workflows</td>
<td>Workflow automations created to automate this manual task. The system uses this field to identify the number of automations that have been run.</td>
</tr>
<tr>
<td>Estimated Duration (min) per Task</td>
<td>Estimated time to perform this task manually.</td>
</tr>
<tr>
<td>Estimated Volume per Month</td>
<td>Estimated number of times needed to perform this task manually per month.</td>
</tr>
</tbody>
</table>

**Read-only fields**

<table>
<thead>
<tr>
<th>Start time</th>
<th>Start time for the evaluation period. Configure this value in the Time Range for Calculated Averages module.</th>
</tr>
</thead>
<tbody>
<tr>
<td>End time</td>
<td>End time of the evaluation period. Configure this value in the Time Range for Calculated Averages module.</td>
</tr>
<tr>
<td>Calculated average duration per task (min)</td>
<td>Actual time required to perform this task manually.</td>
</tr>
<tr>
<td>Calculated average volume per month</td>
<td>Actual average number of times this task is performed manually per month.</td>
</tr>
</tbody>
</table>
3. Select one of these submission options:
   • Submit: Saves the record to the table without running any calculations.
   • Submit and process now: Saves the record and calculates the savings based on the hourly rate and the number of workflow contexts for this automation entry.

Create an Orchestration ROI correlated task rule

The correlated task rule applies configurable conditions to fields in a selected table that tell the instance which manual tasks correspond to an automation entry record.

Role required: orchestration_manager

Before starting this procedure, make sure you have created labor rate cards and the appropriate automation entry records for the automated tasks you want to evaluate.

Create conditions that the system can use to correlate manual tasks to the automation entry. For example, a rule on the Incident [incident] table uses these conditions to correlate the employee on-boarding task to values configured in the Employee OnBoarding automation entry record:

   • [Subcategory] [is] [Employee OnBoarding]
   • [Sort description] [contains] [new employee]

When a new employee opens an incident to request services or assets which are typically handled manually, Orchestration applies the usual labor rate for the manual work to the potential automated solution, and then computes the actual savings.

1. Navigate to Orchestration ROI Task Correlation Correlated Tasks Rules .
2. Click New.
3. Fill in the fields on the form, as appropriate.

Table 645: Automation entry form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automation entry</td>
<td>Automation entry record that correlates to the manual task defined by these conditions. The entry record names the workflow used to automate the task and defines the labor rate used to calculate the cost of the task.</td>
</tr>
<tr>
<td>Table</td>
<td>Table to filter, using these conditions. The rule selects records from this table that match the conditions. Information from these records is used to calculate the actual time to perform a manual task and the actual volume for that manual task.</td>
</tr>
<tr>
<td>Condition</td>
<td>Condition builder to use to filter records for this table. Use these conditions to identify all manual tasks correlated to this automation entry.</td>
</tr>
<tr>
<td>Read-only fields</td>
<td></td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Processed on</td>
<td>Date and time that the system performs the matching records lookup. The system automatically searches for new manual tasks matching these conditions.</td>
</tr>
</tbody>
</table>

4. Select one of these submission options:
   - Submit: Saves the record to the table without running any calculations.
   - Submit and process now: Saves the record, looks up all matching tasks, and saves matching record information to the Correlated Tasks [manual_mapping_records] table.

5. To view a rule, select the link in the Table column of the Correlated Tasks Rules related list for the automation entry you want to see.

6. To view the list of tasks that match all correlated rules in the system, navigate to Orchestration ROI Task Correlation Correlated Tasks.

7. To view the list of tasks that match this rule in the system, click Correlated Tasks under Related Links in this form

**Configure the time range for Orchestration ROI calculations**

Select a date range to calculate the average number of tasks and the duration per month for the correlated tasks.

*Role required: orchestration_manager*

By default, the system creates a range ending at the current date and time and extending back over the previous month. You can change this range at any time and recalculate the ROI instantly.

1. Navigate to Orchestration ROI Task Correlation Time Range for Calculated Averages.
2. Enter a new start or end date and time or click the icon to select a date using the calendar.
3. Click Calculate to recalculate the ROI based on the new time range and to save your settings.

**Installed with Orchestration ROI**

Several types of components are installed with the Orchestration - ROI plugin (com.snc.runbook_automation.roi).

*Tables installed with Orchestration ROI*

Tables are added with activation of Orchestration ROI.

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expense and Savings [run_rate_predicted_savings]</td>
<td>Contains the data for the reports in Orchestration ROI Reports Predicted Savings.</td>
</tr>
</tbody>
</table>
| Savings Report [savings_report] | Contains the number of automations that have been run before the date specified in the Processed On column, based on:  
   - Each automation entry’s associated workflows  
   - Estimated savings based on the estimated duration per task.  
   - Calculated savings based on calculated duration.        |
<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detailed Savings Report</td>
<td>Contains a detailed list for the Savings Report [savings_report] table. This list contains each automation's run date and savings for that automation.</td>
</tr>
<tr>
<td>Automation Entries</td>
<td>Contains automation entries that couple labor resources to specific manual tasks. You can specify the estimated duration to perform a task manually and the estimated number of times that a task is performed per month. If this automation entry already has workflow automations implemented, you can specify the associated workflows. The system calculates the savings, based on the labor rate card and the number of workflow automations that have been performed.</td>
</tr>
<tr>
<td>Roadmap Planning</td>
<td>Contains roadmap planning for each automation entry to be implemented. You can provide estimated hours to implement a workflow automation, the automation percentage anticipated by the end of the year, and the starting month to implement the workflow.</td>
</tr>
<tr>
<td>Correlated Tasks</td>
<td>Contains all matching manual tasks for each automation entry. Each task's information is stored in this table for the system to use to calculate the actual duration and volume for each manual task.</td>
</tr>
<tr>
<td>Correlated Tasks Rules</td>
<td>Contains the correlated task rules the system uses to look up manual tasks corresponding to each automation entry.</td>
</tr>
</tbody>
</table>

**Plugins installed with Orchestration ROI**

Plugins are installed with activation of Orchestration ROI, if they are not already active.

<table>
<thead>
<tr>
<th>Plugin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Management</td>
<td>Provides the labor rate cards Orchestration ROI uses to determine the savings for each automated task. See Cost Management for more information.</td>
</tr>
</tbody>
</table>

**Roles installed with Orchestration ROI**

Roles are added with activation of Orchestration ROI.

<table>
<thead>
<tr>
<th>Role title [name]</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orchestration manager</td>
<td>Manages all activities in the Orchestration ROI module.</td>
</tr>
</tbody>
</table>

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UI actions installed with Orchestration ROI
UI actions are added with activation of Orchestration ROI.

Table 646: UI actions for Orchestration - ROI

<table>
<thead>
<tr>
<th>UI action</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Savings Report</td>
<td>Automation Entry Form</td>
<td>Displays the savings report specific to this automation entry, if the associated workflows are not empty.</td>
</tr>
<tr>
<td></td>
<td>[automation_entry_form]</td>
<td></td>
</tr>
<tr>
<td>Estimated and Projected Savings</td>
<td>Automation Entry Form</td>
<td>Displays the estimated savings, based on the estimated duration of the task, and calculated savings, based on the calculated duration of the task.</td>
</tr>
<tr>
<td></td>
<td>[automation_entry_form]</td>
<td></td>
</tr>
<tr>
<td>Show Workflow Context</td>
<td>Detailed Savings Report</td>
<td>Shows the related workflow context.</td>
</tr>
<tr>
<td></td>
<td>[detailed_savings_report]</td>
<td></td>
</tr>
<tr>
<td>Submit AND process now</td>
<td>Automation Entry Form</td>
<td>Processes this new entry</td>
</tr>
<tr>
<td></td>
<td>[automation_entry_form]</td>
<td></td>
</tr>
<tr>
<td>Correlated Tasks</td>
<td>Correlated Tasks Rules</td>
<td>Displays all matching tasks from the Correlated Tasks table.</td>
</tr>
<tr>
<td></td>
<td>[manual_mapping_conditions]</td>
<td></td>
</tr>
<tr>
<td>Detailed Savings Report</td>
<td>Automation Entry Form</td>
<td>Displays the list of automations that have been run, based on associated workflows.</td>
</tr>
<tr>
<td></td>
<td>[automation_entry_form]</td>
<td></td>
</tr>
<tr>
<td>Task</td>
<td>Correlated Tasks Rules</td>
<td>Displays the task record.</td>
</tr>
<tr>
<td></td>
<td>[manual_mapping_records]</td>
<td></td>
</tr>
<tr>
<td>Submit AND process now</td>
<td>Correlated Tasks Rules</td>
<td>Processes a correlated task rule. This action performs matching on the specified table and the filter conditions.</td>
</tr>
<tr>
<td></td>
<td>[manual_mapping_conditions]</td>
<td></td>
</tr>
</tbody>
</table>

Script includes installed with Orchestration ROI
Script includes are added with activation of Orchestration ROI.

<table>
<thead>
<tr>
<th>Script include</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OrchestrationROIAjax</td>
<td>Script that calculates the actual duration and volume of a task.</td>
</tr>
<tr>
<td>OrchestrationROI</td>
<td>Script that calculates the number of workflow contexts, looks up all matching tasks, calculates savings, and other functions used in the UI actions.</td>
</tr>
<tr>
<td>ROIDemoDataUtil</td>
<td>Script that updates demo data timestamps.</td>
</tr>
</tbody>
</table>
Client scripts installed with Orchestration ROI
Client scripts are added with activation of Orchestration ROI.

<table>
<thead>
<tr>
<th>Client script</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display info for processing rules</td>
<td>Correlated Tasks Rules [manual_mapping_conditions]</td>
<td>Displays annotation on the Correlated Task Rule form advising that new task rules are not evaluated until the time specified in the ROI schedule.</td>
</tr>
</tbody>
</table>

Business rules installed with Orchestration ROI
Business rules are added with activation of Orchestration ROI.

<table>
<thead>
<tr>
<th>Business rule</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delete corresponding records</td>
<td>Automation Entry Form [automation_entry_form]</td>
<td>When a record is deleted from the Automation Entry Form [automation_entry_form] table, this business rule deletes all records in other ROI tables that reference this entry.</td>
</tr>
<tr>
<td>Insert into Run Rate &amp; Savings</td>
<td>Automation Entry Form [automation_entry_form]</td>
<td>When a new automation entry is provided, this business rule calculates the estimated savings, based on the estimated duration of a task and its associated labor rate card.</td>
</tr>
<tr>
<td>Insert into Savings Reports</td>
<td>Automation Entry Form [automation_entry_form]</td>
<td>When a new automation entry is provided, this business rule inserts a new record into the Savings Report [savings_report] table with the automations_run field set to 0.</td>
</tr>
</tbody>
</table>

Orchestration ROI reports
Orchestration ROI provides a collection of standard and premium reports to help you calculate savings from automating services in your organization.

The ROI standard reports are included with Orchestration ROI. The premium reports provide enhanced views generated with Performance Analytics and require the Orchestration - ROI Premium plugin.

Orchestration ROI standard reports
The dashboard of standard ROI reports provides summaries, estimated costs, and calculated costs for automated processes.

To access the ROI standard dashboard, navigate to Orchestration ROI Reports Dashboard.

Summary tab
The Summary tab contains four reports on automation categories.
Figure 343: ROI summary report sample
Table 647: Standard ROI summaries by category

<table>
<thead>
<tr>
<th>Report</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual Tasks by Category Over Time</td>
<td>Trend of manual tasks by category over time. For example, if you use automations to perform a portion of the necessary tasks, the report shows the number of tasks still executed manually, decreasing over time.</td>
</tr>
<tr>
<td></td>
<td>• Type: Line chart</td>
</tr>
<tr>
<td></td>
<td>• Table: Detailed Savings Report</td>
</tr>
<tr>
<td></td>
<td>[detailed_savings_report]</td>
</tr>
<tr>
<td>Automations by Category Over Time</td>
<td>Trend of automated tasks by category over time. For example, this chart can show the increase in the number of automated tasks as a workflow automation rolls out slowly over time.</td>
</tr>
<tr>
<td></td>
<td>• Type: Line chart</td>
</tr>
<tr>
<td></td>
<td>• Table: Detailed Savings Report</td>
</tr>
<tr>
<td></td>
<td>[detailed_savings_report]</td>
</tr>
<tr>
<td>Automation Savings by Category Over Time</td>
<td>Amount of savings from automated tasks over time, based on the estimated duration of the task, the number of automations performed, and the cost from the labor rate card.</td>
</tr>
<tr>
<td>(Uses Estimated Duration)</td>
<td>• Type: Line chart</td>
</tr>
<tr>
<td></td>
<td>• Table: Detailed Savings Report</td>
</tr>
<tr>
<td></td>
<td>[detailed_savings_report]</td>
</tr>
<tr>
<td>Automation Savings by Category Over Time</td>
<td>Amount of savings from automated tasks over time, based on the calculated duration of the task, the number of automations performed, and the cost from the labor rate card.</td>
</tr>
<tr>
<td>(Uses Calculated Duration)</td>
<td>• Type: Line chart</td>
</tr>
<tr>
<td></td>
<td>• Table: Detailed Savings Report</td>
</tr>
<tr>
<td></td>
<td>[detailed_savings_report]</td>
</tr>
</tbody>
</table>

**Estimated Costs tab**

The Estimated Costs tab contains eight reports on estimated time and expense for automations.
Figure 344: ROI estimated time and expense report samples
<table>
<thead>
<tr>
<th>Report</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Time Spent by Task Category</td>
<td>Total estimated time spent, in minutes, on all tasks by task category.</td>
</tr>
<tr>
<td></td>
<td>• Type: Pie chart</td>
</tr>
<tr>
<td></td>
<td>• Table: Automation Entry Form</td>
</tr>
<tr>
<td></td>
<td>[automation_entry_form]</td>
</tr>
<tr>
<td>Estimated Volume of Manual Tasks per Month by Category</td>
<td>Total estimated volume of all tasks per month by task category.</td>
</tr>
<tr>
<td></td>
<td>• Type: Pie chart</td>
</tr>
<tr>
<td></td>
<td>• Table: Automation Entry Form</td>
</tr>
<tr>
<td></td>
<td>[automation_entry_form]</td>
</tr>
<tr>
<td>Predicted Hours Spent Monthly by Category (Uses Estimated Duration &amp; Volume)</td>
<td>Total predicted hours spent monthly on all manual tasks by category, using the estimated duration of each task and the estimated volume of each task per month.</td>
</tr>
<tr>
<td></td>
<td>• Type: Bar chart</td>
</tr>
<tr>
<td></td>
<td>• Table: Expense and Savings</td>
</tr>
<tr>
<td></td>
<td>[run_rate_predicted_savings]</td>
</tr>
<tr>
<td>Predicted Monthly Expense by Category (Uses Estimated Duration &amp; Volume)</td>
<td>Total predicted monthly expense for all manual tasks by category, using the estimated duration of each task, estimated volume of each task per month, and the cost from the labor rate card.</td>
</tr>
<tr>
<td></td>
<td>Note: This report uses negative numbers to express an expense.</td>
</tr>
<tr>
<td></td>
<td>• Type: Bar chart</td>
</tr>
<tr>
<td></td>
<td>• Table: Expense and Savings</td>
</tr>
<tr>
<td></td>
<td>[run_rate_predicted_savings]</td>
</tr>
<tr>
<td>Predicted Hours Spent Quarterly by Category (Uses Estimated Duration &amp; Volume)</td>
<td>Total predicted hours spent quarterly on all manual tasks by category, using the estimated duration of each task and the estimated volume of each task per month.</td>
</tr>
<tr>
<td></td>
<td>• Type: Bar chart</td>
</tr>
<tr>
<td></td>
<td>• Table: Expense and Savings</td>
</tr>
<tr>
<td></td>
<td>[run_rate_predicted_savings]</td>
</tr>
<tr>
<td>Report</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Predicted Quarterly Expense by Category (Uses Estimated Duration &amp; Volume)</td>
<td>Total predicted quarterly expense for all manual tasks by category, using the estimated duration of each task, estimated volume of each task per month, and the cost from the labor rate card.</td>
</tr>
<tr>
<td></td>
<td>Note: This report uses negative numbers to express an expense.</td>
</tr>
<tr>
<td></td>
<td>Type: Bar chart</td>
</tr>
<tr>
<td></td>
<td>Table: Expense and Savings [run_rate_predicted_savings]</td>
</tr>
<tr>
<td>Predicted Hours Spent Annually by Category (Uses Estimated Duration &amp; Volume)</td>
<td>Total predicted hours spent annually on all manual tasks by category, using the estimated duration of each task and the estimated volume of each task per month.</td>
</tr>
<tr>
<td></td>
<td>Type: Bar chart</td>
</tr>
<tr>
<td></td>
<td>Table: Expense and Savings [run_rate_predicted_savings]</td>
</tr>
<tr>
<td>Predicted Annual Expense by Category (Uses Estimated Duration &amp; Volume)</td>
<td>Total predicted annual expense for all manual tasks by category, using the estimated duration of each task, estimated volume of each task per month, and the cost from the labor rate card.</td>
</tr>
<tr>
<td></td>
<td>Note: This report uses negative numbers to express an expense.</td>
</tr>
<tr>
<td></td>
<td>Type: Bar chart</td>
</tr>
<tr>
<td></td>
<td>Table: Expense and Savings [run_rate_predicted_savings]</td>
</tr>
</tbody>
</table>

**Costs from Correlated Tasks tab**

The Costs from Correlated Tasks tab contains eight reports on time and expense for automations based on actual calculations.
Figure 345: ROI calculated time and expense report samples
Table 649: Standard ROI calculated time and expense of automations

<table>
<thead>
<tr>
<th>Report</th>
<th>Description</th>
</tr>
</thead>
</table>
| Time Spent by Task Category                 | Total actual time spent, in minutes, on all tasks by task category.  
  • Type: Pie chart  
  • Table: Automation Entry Form [automation_entry_form] |
| Volume of Manual Tasks per Month by Category| Total actual volume of all tasks per month by task category.  
  • Type: Pie chart  
  • Table: Automation Entry Form [automation_entry_form] |
| Projected Hours Spent Monthly by Category   | Total projected hours spent monthly on all manual tasks by category, using the calculated duration of each task and the calculated volume of each task per month.  
  • Type: Bar chart  
  • Table: Expense and Savings [run_rate_predicted_savings] |
| Projected Monthly Expense by Category       | Total projected monthly expense for all manual tasks by category using the calculated duration of each task, the calculated volume of each task per month, and the cost from the labor rate card.  
  • Note: This report uses negative numbers to express an expense.  
  • Type: Bar chart  
  • Table: Expense and Savings [run_rate_predicted_savings] |
| Projected Hours Spent Quarterly by Category | Total projected hours spent quarterly on all manual tasks by category, using the calculated duration of each task and the calculated volume of each task per month.  
  • Type: Bar chart  
  • Table: Expense and Savings [run_rate_predicted_savings] |
### London ServiceNow Now Platform Capabilities

<table>
<thead>
<tr>
<th>Report</th>
<th>Description</th>
</tr>
</thead>
</table>
| Projected Quarterly Expense by Category (Uses Calculated Duration & Volume) | Total projected quarterly expense for all manual tasks by category using the calculated duration of each task, the calculated volume of each task per month, and the cost from the labor rate card.  
  **Note:** This report uses negative numbers to express an expense.  
  - Type: Bar chart  
  - Table: Expense and Savings [run_rate_predicted_savings] |
| Projected Hours Spent Annually by Category (Uses Calculated Duration & Volume) | Total projected hours spent annually on all manual tasks by category, using the calculated duration of each task and the calculated volume of each task per month.  
  - Type: Bar chart  
  - Table: Expense and Savings [run_rate_predicted_savings] |
| Projected Annual Expense by Category (Uses Calculated Duration & Volume) | Total projected annual expense for all manual tasks by category using the calculated duration of each task, the calculated volume of each task per month, and the cost from the labor rate card.  
  **Note:** This report uses negative numbers to express an expense.  
  - Type: Bar chart  
  - Table: Expense and Savings [run_rate_predicted_savings] |

**Schedule Orchestration ROI calculations for standard reports**

The scheduled job that calculates Orchestration ROI standard reports is active by default and controlled by system properties.

**Role required:** orchestration_manager, admin

The system provides a default scheduled job called Processing ROI Schedule that allows you to configure when Orchestration calculates the ROI for standard reports. This schedule allows scripting for advanced conditions. To modify the schedule or write a script to run, open Processing ROI Schedule from System Scheduler Scheduled Jobs Scheduled Jobs and click Configure Job Definition. To execute the schedule directly from the job definition, click Execute Now.

To control the running of the schedule job with the Orchestration properties:

1. Navigate to Orchestration ROI Properties.
2. Configure the following properties:
Table 650: ROI schedule properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>roi.processing.active</td>
<td>Activate scheduled job for ROI processing. This property activates the Processing ROI Schedule scheduled job.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default: true</td>
</tr>
<tr>
<td>roi.processing.interval</td>
<td>Scheduled ROI processing interval (hours). This property sets the repeat interval for the scheduled job that processes savings reports and correlated tasks.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default: 24</td>
</tr>
</tbody>
</table>

3. Click Save to save your changes.

Orchestration ROI premium reports
The premium dashboard provides detailed reports on calculated savings over time.

The ROI premium reports require the Orchestration - ROI Premium plugin and are built using Performance Analytics concepts. The Orchestration - ROI Premium plugin is dependent on the Performance Analytics - Premium plugin which requires a separate subscription.

**Important**: You must activate the Performance Analytics scheduled collection job before Orchestration ROI premium can display data.

To access the ROI premium dashboard, navigate to Orchestration ROI Reports Premium Dashboard.

ROI By Category tab
The ROI By Category tab contains three reports showing the calculated savings over time by category.
Figure 346: Calculated savings monthly by category

Table 651: Premium reports for calculated savings over time by category

<table>
<thead>
<tr>
<th>Report</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROI - Monthly By Category</td>
<td>Shows the calculated savings each month by category. The chart displays the total calculated savings against the calculated savings for each category.</td>
</tr>
<tr>
<td></td>
<td>• Type: Column chart</td>
</tr>
<tr>
<td></td>
<td>• Table: Detailed Savings Report [detailed_savings_report]</td>
</tr>
<tr>
<td>ROI - By Category</td>
<td>Shows the trend of calculated savings by category.</td>
</tr>
<tr>
<td></td>
<td>• Type: Spline chart</td>
</tr>
<tr>
<td></td>
<td>• Table: Detailed Savings Report [detailed_savings_report]</td>
</tr>
<tr>
<td>ROI - Running Sum 12 month period</td>
<td>Shows the running sum of calculated savings for all categories in the last 12 months.</td>
</tr>
<tr>
<td></td>
<td>• Type: Area chart</td>
</tr>
<tr>
<td></td>
<td>• Table: Detailed Savings Report [detailed_savings_report]</td>
</tr>
</tbody>
</table>
ROI By Automation Entry

The ROI By Automation Entry tab contains two reports showing the calculated savings over time by automation entry.

Figure 347: Calculated savings for the current month by automation entry

Table 652: Calculated savings over time by automation entry

<table>
<thead>
<tr>
<th>Report</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROI By Automation Entry</td>
<td>Shows the current month’s calculated savings for each automation entry.</td>
</tr>
<tr>
<td></td>
<td>• Type: Column</td>
</tr>
<tr>
<td></td>
<td>• Table: Detailed Savings Report [detailed_savings_report]</td>
</tr>
<tr>
<td>ROI - By Automation Entry Top 10 List</td>
<td>Shows the top 10 automation entries that have the most calculated savings</td>
</tr>
<tr>
<td></td>
<td>in the current month.</td>
</tr>
<tr>
<td></td>
<td>• Type: Scorecard</td>
</tr>
<tr>
<td></td>
<td>• Table: Detailed Savings Report [detailed_savings_report]</td>
</tr>
</tbody>
</table>

Activate Orchestration ROI premium reports

To view the Orchestration ROI premium reports, you must activate the Orchestration - ROI Premium (com.snc.runbook_automation.roi_premium) plugin.
The Orchestration - ROI Premium plugin requires the Performance Analytics - Premium plugin, which must be purchased separately.

Role required: admin

The Orchestration - ROI Premium plugin is included with an Orchestration subscription, but must be activated by request.

1. In the HI Service Portal, click Service Requests Activate Plugin.
2. Fill out the form.

<table>
<thead>
<tr>
<th>Target Instance</th>
<th>Instance on which to activate the plugin.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plugin Name</td>
<td>Name of the plugin to activate.</td>
</tr>
<tr>
<td>Specify the date and time you would like this plugin to be enabled</td>
<td>Date and time must be at least 2 business days from the current time.</td>
</tr>
</tbody>
</table>

**Note:** Plugins are activated in two batches each business day in the Pacific time zone, once in the morning and once in the evening. If the plugin must be activated at a specific time, enter the request in the Reason/Comments.

| Reason/Comments | Provide any information that would be helpful for the ServiceNow personnel activating the plugin. For example, if you need the plugin activated at a specific time instead of during one of the default activation windows. |

3. Click Submit.

Schedule Orchestration ROI calculations for premium reports

Orchestration ROI premium reports use a Performance Analytics job that must be activated before premium reports can be generated.

Role required: orchestration_manager, admin

The scheduled job required to calculate premium ROI reports is called [PA ROI] Historic Data Collection and is installed with the Orchestration - ROI Premium [com.snc.runbook_automation.roi_premium] plugin. This job is not active by default.

1. Navigate to Performance Analytics Data Collector Jobs.
2. Search for the [PA ROI] Historic Data Collection job.
3. Select the Active check box.
4. The scheduling options appear for the value selected in the Run field.
   For instructions on creating a schedule, see Create or schedule a data collection job.
5. To execute the schedule directly from the job definition, click Execute Now.
6. Click Update.
Client Software Distribution

The Client Software Distribution (CSD) application allows administrators to distribute software from the service catalog using third-party management systems.

CSD allows an administrator to create all the records necessary to deploy software from service catalog requests, including software models and catalog items. You can use the CSD application to automate the deployment and revocation of software from an SCCM host using the custom SCCM activity pack. You can define lease periods for software distributed from the Service Catalog and allow lease extensions in some cases, pending approvals. Deployment is accomplished using Orchestration activities and workflows.

CSD also integrates with Software Asset Management to manage license counts for deployed software.
Activate client software distribution

Client software distribution requires the Orchestration - Client Software Distribution plugin (com.snc.orchestration.client_sf_distribution), which is available by request with a subscription to Orchestration.
The Orchestration - Client Software Distribution plugin activates the Orchestration - System Center Configuration Manager plugin that contains the custom SCCM activities used to deploy or revoke software using an SCCM server. For additional plugin dependencies, see Plugins installed with client software distribution on page 1789.

**Note:** The Orchestration - Client Software Distribution plugin runs in its own application scope.

1. In the HI Service Portal, click Service Requests Activate Plugin.
2. Fill out the form.

<table>
<thead>
<tr>
<th>Target Instance</th>
<th>Instance on which to activate the plugin.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plugin Name</td>
<td>Name of the plugin to activate.</td>
</tr>
<tr>
<td>Specify the date and time you would like this plugin to be enabled</td>
<td>Date and time must be at least 2 business days from the current time.</td>
</tr>
</tbody>
</table>

**Note:** Plugins are activated in two batches each business day in the Pacific time zone, once in the morning and once in the evening. If the plugin must be activated at a specific time, enter the request in the Reason/Comments.

| Reason/Comments | Provide any information that would be helpful for the ServiceNow personnel activating the plugin. For example, if you need the plugin activated at a specific time instead of during one of the default activation windows. |

3. Click Submit.

Installed with client software distribution

Several types of components are installed with client software distribution (CSD).

**Tables installed with client software distribution**

These tables are installed with the Orchestration - Client Software Distribution plugin (com.snc.orchestration.client_sf_distribution).

**Table 653: Client software distribution tables**

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client Software Distribution Catalog Item</td>
<td>Contains all catalog items created for client software distribution. This table extends the Catalog Item [sc_cat_item] table.</td>
</tr>
<tr>
<td>[sn_client_sf_dist_cat_item]</td>
<td></td>
</tr>
<tr>
<td>Client Software Distribution Software Request</td>
<td>Contains all requested software, and their statuses.</td>
</tr>
<tr>
<td>[sn_client_sf_dist_req_software]</td>
<td></td>
</tr>
<tr>
<td>Client Software Distribution Application</td>
<td>Contains all discovered CSD applications.</td>
</tr>
<tr>
<td>[sn_client_sf_dist_application]</td>
<td></td>
</tr>
<tr>
<td>Client Software Distribution Provider</td>
<td>Contains all software distribution providers.</td>
</tr>
<tr>
<td>[sn_client_sf_dist_provider]</td>
<td></td>
</tr>
</tbody>
</table>
### London ServiceNow Now Platform Capabilities

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client Software Distribution Extension Key [sn_client_sf_dist_extension_key]</td>
<td>Contains the predefined CSD extension keys.</td>
</tr>
<tr>
<td>Client Software Distribution Extension Point [sn_client_sf_dist_extension_point]</td>
<td>Contains the customization script for the extension keys.</td>
</tr>
<tr>
<td>Client Software Distribution Software Configuration [sn_client_sf_dist_software_config]</td>
<td>Base table for all software provider configurations.</td>
</tr>
<tr>
<td>SCCM Server Instance [sn_client_sf_dist_cmdb_ci_sccm_server]</td>
<td>Contains all SCCM server instances. This table extends the Configuration Item [cmdb_ci] table.</td>
</tr>
<tr>
<td>SCCM Application [sn_client_sf_dist_sccm_application]</td>
<td>Contains all discovered SCCM applications. This table extends the Client Software Distribution Application [sn_client_sf_dist_application] table.</td>
</tr>
<tr>
<td>SCCM Application Catalog Item [sn_client_sf_dist_sccm_app_cat_item]</td>
<td>Contains all catalog items created for SCCM applications. This table extends the Client Software Distribution Catalog Item [sn_client_sf_dist_cat_item] table.</td>
</tr>
<tr>
<td>SCCM Collection [sn_client_sf_dist_sccm_collection]</td>
<td>Contains all discovered SCCM collections. Contains all discovered SCCM collections.</td>
</tr>
<tr>
<td>SCCM Deployment [sn_client_sf_dist_sccm_deployment]</td>
<td>Contains all discovered SCCM deployments. Contains all discovered SCCM deployments.</td>
</tr>
<tr>
<td>SCCM Configuration [sn_client_sf_dist_sccm_config]</td>
<td>Contains the SCCM application, install and uninstall collections, and Discovery model. This table extends the Client Software Distribution Software Configuration [sn_client_sf_dist_software_config] table.</td>
</tr>
</tbody>
</table>

**Plugins installed with client software distribution**

These plugins are installed with the Orchestration - Client Software Distribution plugin, if they are not already active.

For instructions on requesting activation of Client Software Distribution (CSD) see *Activate client software distribution* on page 1787.

### Table 654: Plugins for Orchestration - Client Software Distribution

<table>
<thead>
<tr>
<th>Plugin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orchestration - System Center Configuration Manager [com.snc.orchestration.sccm_mgnt]</td>
<td>Installs the custom SCCM Orchestration activities that do work on the SCCM target host.</td>
</tr>
<tr>
<td>Orchestration - Asset Lease Management [com.snc.orchestration.asset_lease_management]</td>
<td>Installs the <em>lease functionality</em> for software distributed through the Service Catalog. This includes starting, stopping, and extending leases.</td>
</tr>
<tr>
<td>Service Catalog Scoped API [com.glideapp.servicecatalog.scoped.api]</td>
<td>Installs the API to support application creation in the Service Catalog.</td>
</tr>
<tr>
<td>Plugin</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
</tr>
<tr>
<td>Software Asset Management [com.snc.software_asset_management]</td>
<td>Provides the ability to manage software assets, including the reconciliation of entitlements to licenses for named users, workstation, and enterprise software agreements.</td>
</tr>
</tbody>
</table>

**Roles installed with client software distribution**
These roles are installed with the Orchestration - Client Software Distribution plugin.

**Table 655: Roles for Orchestration - Client Software Distribution**

<table>
<thead>
<tr>
<th>Role title [name]</th>
<th>Description</th>
<th>Contains Roles</th>
</tr>
</thead>
</table>
| Client software distribution admin [sn_client_sf_dist.csd_admin] | Administrator role for managing client software distribution application. | • sam  
• agent_admin  
• report_admin  
• catalog_admin  
• itil  
• workflow_admin |

**Script includes installed with client software distribution**
These script includes are installed with the Orchestration - Client Software Distribution plugin

**Table 656: Script includes for Orchestration - Client Software Distribution**

<table>
<thead>
<tr>
<th>Script include</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSDExtensionPoint</td>
<td>Execute the CSD provider's specific code</td>
</tr>
<tr>
<td>CSDUtil</td>
<td>Utility functions for the CSD application.</td>
</tr>
<tr>
<td>RefQualsCSD</td>
<td>Reference qualifier filter. This script provides the filter functions for the CSD providers, devices, SCCM application, install collections, and uninstall collections.</td>
</tr>
<tr>
<td>SCCMCatItemHandler</td>
<td>Sets the field values of specific SCCM catalog items. These values are the SCCM catalog item table name, catalog item name, SCCM provider, and SCCM software configuration.</td>
</tr>
<tr>
<td>SoftwareCatItemCreator</td>
<td>Creates software catalog items</td>
</tr>
<tr>
<td>CSDCatItemHandler</td>
<td>Base class for CSD catalog item creation. This script is used by the Create Catalog Item UI action to create and application catalog.</td>
</tr>
<tr>
<td>CSDDemoDataUtil</td>
<td>Populates demo data.</td>
</tr>
<tr>
<td>CSDDemoDataUtilAjax</td>
<td>Populates demo data.</td>
</tr>
</tbody>
</table>

**Properties installed with client software distribution**
Properties for client software distribution (CSD) manage the installation status of requested software deployments and configure scheduled Discoveries.
To access CSD properties, navigate to Client Software Distribution Properties. The following properties are available:

<table>
<thead>
<tr>
<th>Property</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| Status check expiration interval (days)            | sn_client_sf_dist.softwareInstallExpDays | Controls how many days the system waits before ignoring the software installation status. The default time limit for installing software is 30 days before the system stops checking the installation status of a deployment. Installation statuses are:  
  • Not installed: User has not installed requested software prior to the expiration of the configured time limit.  
  • Installed: Software was installed within the configured time limit.  
  • Status check expired: Time limit has expired for the user to install the requested software. The system no longer checks the status of this deployment.  
  • Revoked: Software was revoked by the administrator.  
  • Type: integer  
  • Default value: 30 |
| Reconcile software installation status interval (hours) | sn_client_sf_dist.softwareInstallIntervalHour | Determines when the scheduled job runs that determines the installation status. By default, the system checks the installation status every hour.  
  • Type: integer  
  • Default value: 24 |
### Property | Name | Description
--- | --- | ---
Set scheduled application Discovery interval (days). | sn_client_sf_dist.discoveryExeDay | Sets the repeat interval for the scheduled job that runs application Discovery. By default, Discovery runs at midnight on the day set with this value.  
- Type: integer  
- Default value: 5

Set lease execution schedule job interval (minutes) | sn_client_sf_dist.lease_execution_interval | Interval in which the CSD Lease Schedule scheduled job checks for requested software leases to start, stop, or extend.  
- Type: integer  
- Default value: 1

Set time prior to lease end to notify requester (days) | sn_client_sf_dist.lease_end_notification | Determines how many days prior to the end of a software lease to notify the requester. If lease extensions are allowed, ensure that this period provides enough time for the approval process to complete before the lease expires.  
- Type: integer  
- Default value: 5

---

### Workflows installed with client software distribution
These workflows are installed with the Orchestration - Client Software Distribution plugin

| Workflow | Description |
--- | --- |
Discover SCCM | Retrieves lists of applications, collections, and deployments from SCCM servers using custom CSD orchestration activities. An administrator runs this workflow from a UI action in a SCCM Server Instance record. |
Order Client Software | Runs automatically when a user orders software from the service catalog. |
Deploy SCCM Application | Triggered by the Order Client Software workflow to deploy software through SCCM server. This workflow adds either the user or the device into the SCCM collection. |
<table>
<thead>
<tr>
<th>Workflow</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Revoke Client Software</strong></td>
<td>Begins the software revocation process for software deployed by an external provider. Administrators run this workflow from a UI action on the Requested Software record and the Installed Software Not Entitled record. This workflow triggers the appropriate provider workflow that performs the actual revocation. For example, this workflow triggers the Revoke SCCM Application workflow for applications in SCCM uninstall collections.</td>
</tr>
<tr>
<td><strong>Revoke SCCM Application</strong></td>
<td>Revokes SCCM applications that are members of an uninstall collection. The Revoke Client Software workflow triggers this workflow to revoke software deployed by an SCCM server. This workflow moves either the user or the device from the SCCM collection into the appropriate uninstall collection.</td>
</tr>
</tbody>
</table>

Create licenses and counters for distributed software

Licenses and software counters are associated with the software model and must be created if you want to track the license for software deployed by client software distribution (CSD).

Role required: sam or admin

You can create software licenses and counters in Software Asset Management for software items deployed from the service catalog by CSD. CSD depends on the software counter result to determine if the license is available for the requested software. If the license Valuation is greater than 0, and the license type is Not allocated, CSD assumes that the license is available for the software.

1. Navigate to Software Asset Software Licenses.
2. Add a new software license for the software model you used in CSD.
3. Navigate to Software Asset Reconciliation Software Counters.
4. Create a software counter for the software model you created.
5. Run the counter to retrieve the software license information.

Client software distribution ordering process

Software deployed by Client Software Distribution (CSD) can be ordered from the service catalog by individual users or by approved users on behalf of others.

Client Software Distribution catalog items have different options, depending on how ordering is configured.

Lease start and end dates

All software deployed by CSD requires users to specify the beginning date for the lease. This is enforced by the Orchestration - Asset Lease Management plugin that is activated automatically with CSD. The system prepopulates the Lease start field with the current date and time.

If the catalog item is configured for revocation (uninstall), the form displays the Lease end field, which allows the requester to define an end date and time for the lease. The system validates user input in these fields to ensure that the dates selected define a future window. The Lease end field is not mandatory and can be left blank to order software with no end date.
**Note:** For systems deploying software from Microsoft System Center Configuration Management (SCCM), the Lease end field is only available if the *SCCM configuration* specifies an uninstall collection.

---

**Software offered only to the logged in user**

If the *software catalog item* is configured with the Order on behalf of check box cleared, the User field does not appear on the order form. The logged in user selects the device on which to deploy the software from the Device to install this software on field. Only those devices assigned to the logged in user appear in the list.

In this example, a user has logged into the service catalog to order Firefox for a computer that is assigned to her. She selects the machine from a list of devices she owns and selects the date and time the lease should begin. This software is deployed through Microsoft System Center Configuration Management (SCCM), but does not have an uninstall collection configured and cannot be revoked automatically by the system. As a result, the Lease end field is not available.
Figure 349: Ordering software as the logged in user

Software ordered on behalf of another user

If the software catalog item is configured with the Order on behalf of check box selected, the User field appears on the form. The logged in user can select any user from this field. The Device to install this software on field only lists the devices assigned to the user selected in the User field. If an approval is required for software ordered on behalf of another user, the system automatically sends an approval request to the manager of the user receiving the software. The approval is skipped if the requester is the named user's manager.

In this example, a manager is ordering Google Chrome for a contractor. The manager selects the contractor from the User field and then chooses a computer from the list of devices assigned to the contractor. This software has an SCCM uninstall collection configured, which allows the manager to select an end date for the lease that coincides with the end of the user's contract. When the lease expires, SCCM automatically uninstalls the software from the device.
Extend a software lease

Users of software deployed by Client Software Distribution (CSD) can request the extension of a lease window, if the software is revocable by a software distribution system.

Role required: Any system user

If your software has a lease end date defined, and the software status is Installed, you can request an extension of the lease, pending any approvals your organization requires.

1. Navigate to Service Catalog My Requested Software.
   The list shows only the software you have requested from the service catalog.
2. Select the record for the installed software whose lease you want to extend.
3. Under Related Links click Extend Lease.
4. In the dialog box that appears, select a new lease end date in the calendar and click OK. You must select a date later than the current date.

If the lease extension is subject to manager approval, you are notified of the decision. If the request is approved, a notification shows the new lease end date. If the new end date is within 5 days (the default notification period) of the date when you made the request, CSD sends an immediate end-of-lease notification.

**Important:** If lease extensions in your organization require approval, make sure the approver is available and has enough time to process your extension request. If the extension cannot be approved before the original end date expires, the software is revoked.
Client software distribution from SCCM

You can use Client Software Distribution (CSD) to deploy and revoke software deployments from Microsoft System Center Configuration Management (SCCM) and manage distributions on SCCM hosts.

The SCCM activity pack contains Orchestration activities that CSD uses to deploy software from a service catalog request and manage user and device collections on SCCM servers. In addition, CSD can manage license counts for deployed software using ServiceNow Software Asset Management, revoke software deployed by SCCM without user interaction, and manage lease periods.

Configuring SCCM

Follow the SCCM configuration procedures in the order shown.

Configure the Application Administrator role on the SCCM server

To deploy software using ServiceNow® Client Software Distribution (CSD), ensure that an SCCM administrative user has the correct permissions to deploy software and that PowerShell is properly configured.

SCCM role required: Application Administrator

These instructions are for Microsoft 2012 R2 Server.

1. In the System Center Configuration Manager console, navigate to Administration Security Administrative Users.
2. Right-click the user to whom you want to grant the Application Administrator role.
3. Select Properties from the drop-down menu.
4. In the Properties dialog box, select the Security Roles tab.
5. Ensure that the user has the Application Administrator role.
6. If the user does not already have this role, click Add, select this role from the list, and click OK.
Figure 352: Granting the Application Administrator role on the SCCM server
7. Log into SCCM as the user with the Application Administrator role.
8. Open the menu from the upper left corner of the console and select Connect via Windows PowerShell.

![Figure 353: Connect to PowerShell](image)

9. Ensure that the user can access the CM console.
   This action establishes the environment path to PowerShell for the logged in Application Administrator user.

Update the SCCM cmdlet libraries
Ensure that the System Center Configuration Manager SCCM Cmdlet Library is up-to-date.

SCCM role required: Either current user or system administrator, depending on settings.

The System Center Configuration Manager SCCM Cmdlet Library installs and updates the Windows PowerShell module for SCCM. SCCM checks for library updates on a daily basis. Out-of-date libraries can cause Discovery of the SCCM server to fail, because the system cannot parse the SCCM activity output. This warning message appears in the ECC queue input records for the SCCM GET activities:

WARNING: An update to the System Center 2012 Configuration Manager Cmdlet Library is available. Please go to 'http://go.microsoft.com/fwlink/?LinkId=528947' to download the latest version.

Running cmdlet version: 5.0.8231.1004 Latest cmdlet version: 5.0.8328.1155

If you elect to use an earlier version library, use this procedure to disable the CM update check, which allows Discovery to proceed without issues.

1. Log into the SCCM console as an administrator.
2. Open the menu from the upper left corner of the console.
4. Run one of these commands to disable the update check:
   - Per-user: Set-CMCmdletUpdateCheck -CurrentUser -IsUpdateCheckEnabled 0
   - Per-system: Set-CMCmdletUpdateCheck -System -IsUpdateCheckEnabled 0

   **Important:** The per-system cmdlet must run in an elevated Windows PowerShell session.

5. Run the Get-CMCmdletUpdateCheck command to refresh the console and check the settings.
6. Ensure that the value of the IsEnabled configuration variable has changed to False.
   This indicates that the warning for an out of date cmdlet library is disabled for the users specified.
7. To re-enable the update check, run the -IsUpdateCheckEnabled 1 command for either the current user or for the system.

### Configure the MID Server for SCCM activities

To use a MID Server with Microsoft System Center Configuration Management (SCCM) activities, configure it to communicate with the SCCM server.

Role required: admin

1. In the navigation filter, enter cmdb_ci_dns_name.list.
2. Click New.
3. Enter the fully-qualified domain name (FQDN) of the SCCM server in the Name field.
4. Right-click in the form header and select Save.
5. In the IP Address related list, click New.
6. In the IP Address field, enter the IP address of the SCCM server.
7. In the Nic field, select eth0 or your preferred network interface controller.
8. Leave the Netmask field blank.
9. Click Submit.

### Create Windows credentials for SCCM deployments

Microsoft System Center Configuration Manager (SCCM) requires the appropriate credentials to deploy applications using the Client Software Distribution application.

Role required: sn_client_sf_dist.csd_admin or admin

Client software distribution requires Windows credentials that have administrative rights on the SCCM server.

1. Navigate to Orchestraton Credentials.
2. Click New.
3. In the list of credential types, select Windows Credentials.
4. Provide a user name and password with administrative rights on the SCCM server.

   **Important:** Ensure the following:
   - This user must have the Application Administrator role on the SCCM server.
• Use the credentials to log into the SCCM Server and connect via Windows PowerShell from the System Center Configuration Manager console at least once to set the path variable for that credential.

5. Fill in the other fields on the form, as appropriate.
   For details, see Windows credentials on page 1054.
6. Click Submit.

Retrieve SCCM data for client software distribution
Retrieve the collections and the list of applications available for deployment from your SCCM servers.
Role required: sn_client_sf_dist.csd_admin or admin

Before starting this procedure:
• Set up your Microsoft System Center Configuration Manager (SCCM) server, create the applications and collections, and configure the deployments you need. For information, see your SCCM documentation.
• Configure a user with the Application Deployment Manager role on the SCCM server.
• Set up the MID Server to communicate with the SCCM server.
• Add Powershell credentials to the ServiceNow Credentials [discovery_credentials] table for the SCCM user who has the Application Deployment Manager role.

To populate the Client Software Distribution application with SCCM data:
1. Navigate to Client Software Distribution SCCM SCCM Server Instance.
2. Click New.
3. In the SCCM Server Instance form, identify the server by name and provide the fully qualified domain name.
4. Click Submit.
   The new SCCM server appears in the list.
5. Open the new SCCM record and click Discover now under Related links.
   The system runs the Discover SCCM workflow that retrieves the application, collection, and deployment data from the SCCM server.
SCCM server Discovery for client software distribution

A Discovery workflow populates ServiceNow tables with collection, application, and deployment data retrieved from SCCM servers.

Users run the Discover SCCM workflow from an SCCM Server Instance record to populate the following ServiceNow tables:

Table 659: SCCM data populated in ServiceNow tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Fields</th>
</tr>
</thead>
</table>
| SCCM Application [sn_client_sf_dist_sccm_application] | • name  
  • publisher  
  • version  
  • model  
  • sccm_server |
| SCCM Collection [sn_client_sf_dist_sccm_collection] | • name  
  • type  
  • sccm_server |
| SCCM Deployment [sn_client_sf_dist_sccm_deployment] | • application  
  • collection  
  • type |
Set up a software model for an SCCM application

Using the applications discovered on the SCCM server, set up a software model used by the Software Asset Management application to manage licenses.

Role required: sn_client_sf_dist.csd_admin or admin

Before creating software models, you must discover the applications available for deployment on the SCCM server. See Retrieve SCCM data for client software distribution on page 1802 for details.

You can link an SCCM application to an existing software model or create a new model.

1. Navigate to Client Software Distribution SCCM SCCM Applications .
   A list of applications discovered on the SCCM server appears.
2. Open an SCCM application record.
3. To link to an existing model, click the magnifying glass icon in the Model field and select a model from the list.<info>

   ![SCCM Application record](image)

   **Figure 355: SCCM application record**

4. To create a model, click Create Software Model under Related Links.
   a) Complete the software model fields.
      See for details.
   b) Click Submit.
      The view returns to the SCCM Applications form.

Define an SCCM configuration

To create catalog items for SCCM software deployment or to configure your instance to revoke software through SCCM, you must first associate that software with a collection through an SCCM configuration.
Before you create an SCCM configuration record, make sure you have discovered the SCCM applications, collections, and deployments and set up the necessary software models.

Role required: sn_client_sf_dist.csd_admin or admin

The SCCM configuration process associates software with SCCM collections. To deploy software from an SCCM server, the user or device must be a member of an SCCM collection associated with an install deployment. Client Software Distribution (CSD) allows you to revoke unentitled software using an SCCM server when that software can be removed using an uninstall collection. Users requesting revokable software from the Service Catalog also have the ability to define lease start and stop dates and request lease extensions.
Figure 356: SCCM table references

1. Navigate to Client Software Distribution SCCM SCCM Applications.
2. Open an application that has a configured software model.
3. Under Related Links, click Create Software Configuration.
4. Complete the form, using the fields in the table.
Figure 357: SCCM configuration form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Recognizable name for this SCCM software configuration.</td>
</tr>
<tr>
<td>SCCM application</td>
<td>Name of an application hosted on the SCCM server.</td>
</tr>
<tr>
<td>SCCM collection</td>
<td>Name of the collection associated with the install deployment for the selected application on the SCCM server. Only those collections associated with the application are available for selection.</td>
</tr>
</tbody>
</table>
| SCCM uninstall collection | Name of the collection associated with the uninstall deployment for the selected application on the SCCM server. You must specify an uninstall collection to:  
  • Define a lease end date for deployed software.  
  • Allow lease extensions.  
  • Revoke software from a user’s machine. |
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discovery model</td>
<td>Discovery model that links the unentitled software installation with the SCCM configuration. From the SCCM configuration record, Client Software Distribution can determine which collection to use to revoke the software. Unentitled software is software found on the user's machine that the user is not entitled to use.</td>
</tr>
</tbody>
</table>

Create a catalog item for an SCCM application

Using the applications discovered on the SCCM server, create a catalog item for an application you want to offer for distribution from the service catalog.

Role required: sn_client_sf_dist.csd_admin or admin

Before creating a catalog item, you must link the application to a software model and create at least one software configuration.

1. Navigate to Client Software Distribution SCCM SCCM Applications.
   A list of applications discovered on the SCCM server appears.
2. Open a record for an SCCM application.
3. Under Related Links, click Create Catalog Item.
   A new SCCM Application Catalog Item record appears with preconfigured information.
Catalog items are available to order software applications from the service catalog. Update name and short description to display for the item. Configure approval processes, license checks, order on behalf of, software configuration and other information as needed.

**Figure 358: SCCM application catalog item**
4. Add price information and complete the following fields added to the Client Software Distribution Catalog Item [sn_client_sf_dist_cat_item] table by the Orchestration - Client Software Distribution plugin:

Table 661: SCCM fields in the catalog item form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skip approval (skip_approval)</td>
<td>Check box that allows skipping approval for this item by the requester's manager when a user orders it from the service catalog. Use this field in conjunction with the Order on behalf of field to ensure that software ordered by a logged in user on behalf of another user is subject to approval. By default, this check box is cleared, requiring manager approval for all new catalog items.</td>
</tr>
</tbody>
</table>

**Note:** There are two levels of approval possible. By default, all category items require group approval for items in excess of $1000. If that approval is given or skipped, the system evaluates the Skip approval check box to determine if the software item requires approval by the requester's manager.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check license compliance</td>
<td>Check box that forces the system to determine if deploying this item is allowed under the current license.</td>
</tr>
</tbody>
</table>
**Field** | **Description**
--- | ---
Order on behalf of | Check box that allows the logged-in user to order this software from the service catalog for another user. This permits service desk personnel to order SCCM deployments for other users in the system. By default, this feature is enabled. To prevent unauthorized users from ordering software, ensure that approvals are required for this type of deployment by clearing the Skip approval check box.

If an approval is required for software ordered on behalf of a user, the system automatically sends an approval request to the manager of the user receiving the software. The approval is skipped if the requestor is the named user's manager.

Software items requested from the service catalog on behalf of a different user require the following information:

- **User**: User selected for deployment. This field is automatically populated with the name of the logged in user. You can select another user from the list.
- **Device to install this software on**: Device belonging to the selected user on which to deploy the software. Only devices belonging to that user appear in the choice list.
- **Lease start**: Date and time to deploy the software. This is the start time for the lease. A lease can be open-ended or have a lease end time.

**SCCM configuration** | Name of the SCCM configuration record for this application. This record defines the collection and uninstall collection for this application. This configuration is required for all deployments, revocations, and leases performed by the SCCM server.

5. If the catalog item requires approval because of cost, be sure to configure an approval group in the Approved By Group related list.

By default, the Service Catalog Request workflow runs when an item costing more than $1000 is ordered and looks for an appropriate approval group. If no approval group is configured for the item, this workflow skips approval altogether and ends. The system then runs the Order Client Software workflow, which evaluates the Skip approval check box to determine if approval by the requester's manager is required.

6. Click Update.

   The view returns to the SCCM Applications list.
7. To see all client software distribution (CSD) catalog items, navigate to Client Software Distribution Maintain Items Software Items.

**Workflow process for SCCM deployment**

Ordering an SCCM application from a client software distribution (CSD) catalog item in the service catalog triggers the Order Client Software workflow.

This process deploys an SCCM application to a user or device through a service catalog order:

1. If the Skip approval check box is cleared in the software catalog item, the Order Client Software workflow sends the catalog request to the requesting user's manager for approval.

2. If the Check license compliance check box is selected in the software catalog item, the workflow performs a software license check. If there is no license available, the workflow creates a catalog task to procure more licenses and assigns the task to the Client Software Distribution Administrators group.

3. The Order Client Software workflow triggers the Deploy SCCM Application workflow as a subflow. This workflow adds either the user or the device to the SCCM collection using the Add to User Collection or Add to Device Collection SCCM activity.

4. If the software configuration specifies SCCM uninstall collection in the software catalog item, the Deploy SCCM Application workflow checks if the user or device exists in the uninstall collection. The workflow uses the Is Device in Collection or Is User in Collection SCCM activity. If the user or device exists in the uninstall collection, the workflow removes the device or user. The workflow uses the Remove from Device Collection or Remove from User Collection SCCM activity before adding it to the SCCM install collection.

**Client software distribution validation process**

After SCCM deploys software to a target computer, client software distribution (CSD) detects the installation and validates its status.

Client software distribution uses the following methods for detecting software installed on the target machine:

- **Discovery**: CSD is configured to leverage Discovery to detect software installations. You can run Discovery manually at any time, or by a scheduled job.

- **Microsoft SCCM Integration**: You can import SCCM data into the CMDB using the features in the Integration - Microsoft SCCM plugin if Discovery is not active on the instance.

The instance uses the data gathered by Discovery or the SCCM integration plugin to populate the Software Installation [cmdb_sam_sw_install] table. To validate installations using this data, CSD runs a scheduled job called Reconcile Requested Software that uses *CSD property* settings. This process reconciles the software installation data accumulated in the CMDB and makes these status updates:

- **Not installed to Installed**: The user has installed the requested software within the time limit configured in the `sn_client_sf_dist.softwareInstallExpDays` property.
- **Not installed to Status check expired**: The time limit has expired for the user to install the requested software. The system stops checking for installation when the time limit expires.

**SCCM software revocation**

An administrator can revoke software without any user interaction using Microsoft System Center Configuration Manager (SCCM) if the software configuration specifies an SCCM uninstall collection, even if the software was installed by some other process or user.

**Revoke software deployed through the service catalog**

Software deployed by SCCM can be revoked, but only when the software's status is Installed and the application associated with the software configuration has an uninstall collection configured.

- Create an *SCCM configuration record* for the application that names an appropriate uninstall collection.
• Associate the CSD catalog item for the application with the SCCM configuration that specifies the uninstall collection.

Role required: sn_client_sf_dist.csd_admin or admin

A workflow called Revoke SCCM Application moves either the user or the device from its respective collection and adds it to the appropriate uninstall collection. When SCCM performs an internal policy check and finds the user or device in the uninstall collection, SCCM removes the related software package from the client computer.

1. Navigate to Client Software Distribution Reports Requested Software.
2. Open the record for the SCCM software package you want to revoke.
   The package must have a Status of Installed to be revocable.
3. Under Related Links, click Revoke software.
   This action runs the Revoke Client Software workflow, which triggers the Revoke SCCM Application subflow that moves the user or device from the install collection to the uninstall collection. When SCCM performs an internal policy check and finds the user or device in the uninstall collection, SCCM removes the related software package from the client computer.

Revoke unentitled software

An administrator can revoke software using Microsoft System Center Configuration Manager (SCCM) that a user is not entitled to use even if the software was installed by some other process or user.

To revoke software using SCCM, you must create an SCCM configuration record for the application, in which the appropriate software Discovery model is defined. See Software discovery models.

Role required: sn_client_sf_dist.csd_admin or admin

Client Software Distribution (CSD) uses Software Asset Management (SAM) to identify unentitled software installations. Discovery detects the software on the user's machine, and SAM determines if the user or device is entitled to use that software. This might include software that was not installed through a catalog request or software that the user installed without approval. If the software installation's Discovery model is associated with an SCCM software configuration that has an uninstall collection defined, then an administrator can use CSD to revoke that software from the user's machine without involving the user.

1. Navigate to Client Software Distribution Reports Installed Software Not Entitled.
2. Select the record for the installation that has unentitled users.
3. Under Related Links, click Revoke software.
   This action runs the Revoke Client Software workflow, which triggers the Revoke SCCM Application subflow that moves the user or device from the install collection to the uninstall collection. When SCCM performs an internal policy check and finds the user or device in the uninstall collection, SCCM removes the related software package from the client computer.
SCCM software revocation workflow
The Revoke SCCM Application workflow moves a user or device from an install collection to an uninstall collection to revoke software installed from Microsoft System Center Configuration Manager (SCCM).

For the revocation workflow to run, the software package must have a status of *Installed* and must be pre-configured for an appropriate uninstall collection. See *Revoke software deployed through the service.*
catalog on page 1812 for configuration instructions. When an administrator initiates the revocation process, the system launches the Revoke SCCM Application workflow to move the user or device collection associated with installation to the appropriate SCCM uninstall collection. When the SCCM server performs a policy check, it finds the additions to the user or device uninstall collection and revokes the software package associated with that collection.

The workflow employs two custom activities, *Remove from User Collection* and *Remove from Device Collection*, to remove either the user or the device from its original collection. The workflow then adds the user or device to the appropriate uninstall collection on the SCCM server with the *Add to User Collection* or *Add to Device Collection* activity.

**Note:** This workflow is triggered by the Revoke Client Software workflow as a subflow.

Client software distribution dashboard

The CSD dashboard provides a collection of visual reports for the Client Software Distribution application. To access the CSD dashboard, navigate to Client Software Distribution Requested Software Dashboard.

![Figure 360: Sample report from CSD dashboard](image)

**Table 662: Client software distribution reports**

<table>
<thead>
<tr>
<th>Report</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Tasks</td>
<td>Displays all open tasks grouped by the requested item's stage value.</td>
</tr>
<tr>
<td></td>
<td>• Type: <em>List reports</em></td>
</tr>
<tr>
<td></td>
<td>• Table: Catalog Task [sc_task]</td>
</tr>
<tr>
<td>Top 10 Applications Installed</td>
<td>Displays the top 10 applications installed by request count.</td>
</tr>
<tr>
<td></td>
<td>• Type: <em>Bar chart</em></td>
</tr>
<tr>
<td></td>
<td>• Table: Requested Software [sn_client_sf_dist_req_software]</td>
</tr>
<tr>
<td>Report</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Total Software Request Item Over Time</td>
<td>Displays the total software items requested each month.</td>
</tr>
<tr>
<td></td>
<td>• Type: <em>Line chart</em></td>
</tr>
<tr>
<td></td>
<td>• Table: Requested Software</td>
</tr>
<tr>
<td></td>
<td>[sn_client_sf_dist_req_software]</td>
</tr>
<tr>
<td>Requests Completed Report</td>
<td>Displays the total of software requests completed each month.</td>
</tr>
<tr>
<td></td>
<td>• Type: <em>Line chart</em></td>
</tr>
<tr>
<td></td>
<td>• Table: Requested Software</td>
</tr>
<tr>
<td></td>
<td>[sn_client_sf_dist_req_software]</td>
</tr>
<tr>
<td>Installed Software Not Entitled</td>
<td>Displays installed software that users or devices are not entitled to use.</td>
</tr>
<tr>
<td></td>
<td>This can be software deployed through CSD or by another process that does</td>
</tr>
<tr>
<td></td>
<td>not comply with licensing. This report is on a Software Asset Management</td>
</tr>
<tr>
<td></td>
<td>table.</td>
</tr>
<tr>
<td></td>
<td>• Type: <em>List reports</em></td>
</tr>
<tr>
<td></td>
<td>• Table: Software Installation</td>
</tr>
<tr>
<td></td>
<td>[cmdb_sam_sw_install]</td>
</tr>
<tr>
<td>Software Installation Status</td>
<td>Displays the count of requested software, grouped by installation status,</td>
</tr>
<tr>
<td></td>
<td>for each month.</td>
</tr>
<tr>
<td></td>
<td>• Type: <em>Line chart</em></td>
</tr>
<tr>
<td></td>
<td>• Table: Requested Software</td>
</tr>
<tr>
<td></td>
<td>[sn_client_sf_dist_req_software]</td>
</tr>
<tr>
<td>Software Requested Item Stage Report</td>
<td>Displays the sum of all requested items, grouped by the requested item's</td>
</tr>
<tr>
<td></td>
<td>stage, for each month.</td>
</tr>
<tr>
<td></td>
<td>• Type: <em>Line chart</em></td>
</tr>
<tr>
<td></td>
<td>• Table: Requested Software</td>
</tr>
<tr>
<td></td>
<td>[sn_client_sf_dist_req_software]</td>
</tr>
<tr>
<td>License Counts Available</td>
<td>Displays the license counts for all available applications.</td>
</tr>
<tr>
<td></td>
<td>• Type: <em>List reports</em></td>
</tr>
<tr>
<td></td>
<td>• Table: SCCM Application Catalog Item</td>
</tr>
<tr>
<td></td>
<td>[sn_client_sf_dist_sccm_app_cat_item]</td>
</tr>
</tbody>
</table>

**Client software distribution extension framework**

Client software distribution (CSD) provides built-in extension points for integrating a ServiceNow instance with client software distribution providers, such as Casper, Altiris, or LANDesk.

**Caution:** The use of CSD extension points is an advanced procedure intended for use by experienced Now Platform developers only. Instructions for customizing your instance to deploy...
Configure client software distribution providers

Identify the provider and specify the workflows and extension points for a customized software distribution process.

Perform the development tasks described in the CSD Extension Implementation Guide before attempting this procedure.

Role required: sn_client_sf_dist.csd_admin, admin

1. Navigate to Client Software Distribution Extensions Providers.
2. Click New.
3. Complete the form using the fields in the table.

![Figure 361: Provider information for Casper integration](image)

Table 663: Client software distribution provider fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Descriptive name of the provider.</td>
</tr>
<tr>
<td>Provider server</td>
<td>Table name of the provider server. You must create this table as an extension of the Configuration Item [cmdb_ci] table. For example, you might call your table Casper Server Instance [cmdb_ci_casper_server_instance].</td>
</tr>
<tr>
<td>Discovery workflow</td>
<td>Workflow that discovers the provider server and returns the data from that server back to the instance. This is the workflow you create with custom activities that query the provider server.</td>
</tr>
</tbody>
</table>
**Field** | **Description**  
--- | ---  
Software configuration | Table name of the software configuration for this provider. You create this table as an extension of the Client Software Distribution Software Configuration [sn_client_sf_dist_software_config] table. For example, you might create a table called Casper Software Configuration [sn_client_sf_dist_casper_sf_config].  
Deployment extension key | The SetDeploymentData key provided with CSD. This key sets up the data for the software ordering and deployment workflow.  
Deployment workflow | Workflow that deploys software from the provider server. This is the workflow you created with custom activities that tells the provider where to deploy an application requested from the service catalog.  
Revocation extension key | The SetRevocationData key provided with CSD. This key sets up the data for installation revocation.  
Revocation workflow | Workflow that revokes an installation from a provider server. This is the workflow you created with custom activities that tells the provider which application to remove from a device.  

---

*Client software distribution extension keys*

Client software distribution (CSD) extension keys allow you to customize the deployment and revocation of software from distribution providers.

These pre-defined keys allow you to generate input variables for workflows that deploy and revoke software from external distribution providers:

- **SetDeploymentData**: Sets the software order information and generates the input variables for the deployment workflow.
- **SetRevocationData**: Generates the input variables for the revocation workflow.
- **CheckRevocable**: Specifies the conditions that determine if an installation can be revoked. If the software configuration associated with the installed software allows uninstallation, the installed software can be revoked.

*Client software distribution extension points*

The client software distribution (CSD) extension points create the customization code for the specific provider and the extension keys.

The purpose of the extension points is to associate extension keys with a specific provider, and then create a script that sets input variables for your custom deployment and revocation workflows. Another extension point script tells CSD if the provider has the capability to revoke software. If this is the case, CSD enables the UI action that triggers revocation from the provider.

**SetDeploymentData**

The script associated with this extension key must set the csdExtensionResult object with these attributes:
• deploymentWorkflowInputs: Object that specifies the deployment workflow input variables.
• softwareModel: Software model sys_id.
• deploymentType: An integer. Use 1 for deployment to a user and 2 for deployment to a device.
• softwareApplication: Software application sys_id.

**CheckRevocable**

The script associated with this extension key gets the input parameter csdExtensionInputs.softwareConfiguration, which is a Client Software Distribution record in the Software Configuration [sn_client_sf_dist_software_config] table. All providers’ software configurations are extended from this table, but may have different attributes.

This script must set the csdExtensionResult object to true or false, depending on whether the software configuration specifies uninstallation.

**SetRevocationData**

The script associated with this extension key gets the input parameter csdExtensionInputs.softwareConfiguration, which is a Client Software Distribution record in the Software Configuration [sn_client_sf_dist_software_config] table. All providers’ software configurations are extended from this table, but may have different attributes.

The script must set the csdExtensionResult object with these attributes:

• revocationWorkflowInput: Object that specifies the revocation workflow input variables.
• softwareModel: Software model sys_id.
• deploymentType: An integer. Use 1 for deployment to a user and 2 for deployment to a device.

**Orchestration examples**

These examples demonstrate how Orchestration can be used to automate common tasks.

**Active Directory automation example**

A set of six Orchestration Active Directory activities enables organizations to automate their on-boarding/off-boarding processes with auditable, self-documenting workflows that save time and eliminate mistakes.

The activities in the *Active Directory activity pack* on page 1841 are designed to manage user accounts and reset user passwords. The following activities cover the most common use cases administrators encounter when managing Active Directory user accounts:

• Create AD User Account
• Update AD User Account
• Remove AD User Account
• Disable AD User Account
• Query AD
• Reset AD User Password.

These activities share a common design, have complementary functionality, and share a common set of parameters. They can be used singly or together to create consistent workflows for provisioning and de-provisioning user accounts.
Update Active Directory with Orchestration

An organization plans to make their ServiceNow instance the single system of record for user account data and wants to update Active Directory with the latest changes.

The solution is to create an Orchestration workflow that pushes changes from the ServiceNow user record down to the Active Directory to create a new user record or update an existing record. This is accomplished by creating an Orchestration workflow that can create and update records in Active Directory based on the data in the ServiceNow User [sys_user] table.

Note: This example workflow assumes that ServiceNow is configured for LDAP and an LDAP server is configured to accept the new user accounts. The Active Directory user management activities are not dependent on LDAP, but the presence of LDAP makes this example workflow much easier. You must provide the domain controller’s IP address to the workflow, either by hardcoding it, adding another workflow input, or using a script to look it up from the CMDB.

1. Navigate to Workflow Workflow Editor.
2. In the Workflow tab, click the + icon to create a new workflow using these variables:
   - Name: Sync AD User
   - Table: Global [global]
3. Click Submit.
   A basic workflow with a Begin and End point appears on the canvas.
4. Click the menu icon in the upper left corner of the canvas and select Edit Inputs from the context menu.
5. In the Workflow Inputs form, click New in the Variables record list, and create a new variable, using the fields in the table.

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Reference</td>
</tr>
<tr>
<td>Label</td>
<td>User</td>
</tr>
<tr>
<td>Column name</td>
<td>u_user</td>
</tr>
<tr>
<td>Reference Specification &gt; Reference</td>
<td>User (sys_user)</td>
</tr>
</tbody>
</table>

6. Click Submit.

7. In the Custom tab, expand Custom Activities Active Directory.
8. Drag and drop the Update AD Object activity onto the transition line between the Begin and End points of the new workflow.
This action automatically links the activity with the end point and opens the Workflow Activity property form.

9. Complete the form using the fields in the table.

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a logical name such as Update user data.</td>
</tr>
</tbody>
</table>
| Domain controller| The ServiceNow LDAP integration adds a reference to the LDAP server to which the user's account is linked. To identify the LDAP server, enter the following statement:  
${workflow.inputs.u_user.ldap_server.server_url}$ |
| Type            | Type of AD object. In this case, the type is User, which is the default. |
| Object name     | This example assumes that the ServiceNow user name matches the Active Directory sAMAccountName. Enter the following:  
${workflow.inputs.u_user.user_name}$ |
| Object data     | Updates the user's account in Active Directory, if the user exists. In this example, the user's title is updated:  
{"title": "QA"} |

10. Click Submit.
The workflow looks like this:

![updated workflow diagram]

Figure 363: Updating an AD user

11. Attach both activity outcomes (Success and Failure) to the end point.
At this point, the workflow takes a ServiceNow user record as input and updates the First Name, Last Name, and Title of the corresponding Active Directory account. If the account does not exist in Active Directory, the workflow fails.

**Note:** In a normal workflow, some type of alternate action is desirable upon failure. For example, you might send an email notification if the workflow failed to update the record.

12. To prevent the workflow from failing, add a Create AD Object activity to the transition lines between Begin and the Update AD Object activity.

13. Complete the Workflow Activity property form using the fields in the table.

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a logical name such as Create user data.</td>
</tr>
<tr>
<td>Domain controller</td>
<td>${workflow.inputs.u_user.ldap_server.server_url}$</td>
</tr>
<tr>
<td>Ou</td>
<td>The organizational unit to which this object belongs. For the purpose of this example, you can enter OU=HQ,OU=Managed Objects</td>
</tr>
<tr>
<td>Object name</td>
<td>${workflow.inputs.u_user.user_name}$</td>
</tr>
<tr>
<td>Object data</td>
<td>Creates an account with only the user name in it. For the purpose of this example, you can enter {&quot;givenName&quot;: ${workflow.inputs.u_user.first_name}$, &quot;SN&quot;: ${workflow.inputs.u_user.last_name}} }</td>
</tr>
</tbody>
</table>

14. Click Submit.

15. Connect the Failure outcome of the Create AD Object activity to End.

For this example, we are ignoring errors. The workflow now looks like this:
This procedure builds a simple workflow that creates a bare-bones Active Directory account consisting of a user name only. The workflow then updates that account with additional information provided by the ServiceNow User [sys_user] table. However, we do not want to execute the Create AD Object activity if the user account already exists. The workflow needs to query Active Directory for matching user records and then branch the workflow based on the results of the query. If an account already exists, then the workflow should update the account. If the account does not exist, then the workflow should create the account in Active Directory.

16. Drag and drop the Query AD activity onto the transition between Begin and Create AD Object.

17. Complete the Workflow Activity property form using the fields in the table.

<table>
<thead>
<tr>
<th>Field</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a logical name such as Search for existing account.</td>
</tr>
<tr>
<td>Domain controller</td>
<td>${workflow.inputs.u_user.ldap_server.server_url}</td>
</tr>
<tr>
<td>Properties</td>
<td>A comma-separated list of Active Directory properties to return. For example, givenName, SN, title. If the parameter field is blank, then all properties are returned. In this workflow, we leave the field blank.</td>
</tr>
<tr>
<td>Search filter</td>
<td>An LDAP filter string that defines the search parameters. Use any valid LDAP filtering criteria. To find user accounts matching the input record, we use: (samaccountname=${workflow.inputs.u_user.user_name})</td>
</tr>
</tbody>
</table>

18. Click Submit.

19. Connect the Failure outcome for the query activity to the End point.

Remember that we are ignoring errors in this workflow.
20. Connect the Success outcome of the query activity to the Update AD Object activity. The workflow now looks like this:

![Workflow Diagram]

The workflow now looks like this:

21. Drag a standard If activity from the Conditions folder in the Core tab and drop it onto the transition between Query AD and Update AD Object.

22. Complete the Workflow Activity properties form using the fields in the table.

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a logical name such as Account exists.</td>
</tr>
<tr>
<td>Advanced</td>
<td>Select this check box to open the Script field.</td>
</tr>
</tbody>
</table>
For the If activity to work correctly, we must return a yes or no in the answer variable (var) which corresponds to the Yes and No outcomes of the query activity. Line 1 converts the Query AD results from a JSON string into a Javascript array called queryResults. Line 2 checks the length of that array. If the array is more than 0, a match to the account was found, and we set our answer to yes. Otherwise, the answer is no.

```javascript
var queryResults = new JSON().decode(data.get(5).output);
answer = (queryResults.length > 0 ? 'yes' : 'no');
```

**Note:** The expression `data.get(5)` in this script identifies the Query AD output in the Databus by order number, since it was the fifth activity added to the workflow.
23. Click Submit.

24. In the canvas, create a transition from the Yes outcome of the If activity to the Update AD Object activity.

25. Create a transition from the No outcome of the If activity to the Create AD Object activity.

This is the final step. This workflow will query Active Directory to determine if an account already exists. If an account exists, the workflow updates that account. If an account does not exist, the workflow creates the account and then updates the Active Directory with the configured user data set.

Figure 366: Query AD outputs in the Databus
Employee Orchestration

Provides a design pattern to implement near-realtime processing of HR events from any HR system. Employee Orchestration enables the ServiceNow instance to receive notifications from an HR system and use this information to trigger workflows. For example, if a new employee is added to Workday, Orchestration analyzes a Workday notification and extracts information on the new employee. Email triggers on the instance launch a workflow containing Workday activities that are configured to retrieve additional information about the new employee. The instance uses this information to create a new sys_user record for the employee or update an existing record.

This process requires configuration on the HR system to send onboarding notifications to the ServiceNow instance. Orchestration identifies notifications from a pre-configured source and extracts information on the new employee from delimited text specified in system properties. Configured values on the HR system and the ServiceNow instance must match for the exchange of information to occur.

Activate Employee Orchestration

Employee Orchestration requires the Orchestration - Workday plugin (com.snc.orchestration.workday), which is available by request with a subscription to Orchestration.

1. In the HI Service Portal, click Service Requests Activate Plugin.
2. Fill out the form.

<table>
<thead>
<tr>
<th>Target Instance</th>
<th>Instance on which to activate the plugin.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plugin Name</td>
<td>Name of the plugin to activate.</td>
</tr>
</tbody>
</table>
Specify the date and time you would like this plugin to be enabled

<table>
<thead>
<tr>
<th>Reason/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide any information that would be helpful for the ServiceNow personnel activating the plugin. For example, if you need the plugin activated at a specific time instead of during one of the default activation windows.</td>
</tr>
</tbody>
</table>

3. Click Submit.

Create the Workday credential

The Workday credential allows Orchestration activities to retrieve employee information from Workday.

Role required: admin

1. Navigate to Employee Orchestration Workday Credential.

2. To enable editing of the form, click the link at the top.

![Figure 368: Editing the credential record](image)

3. Update the form using the fields in the table.
Table 664: Workday credential fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Identifying name for this credential. For example, you might enter Workday.</td>
</tr>
<tr>
<td>Username</td>
<td>Workday user who has integration rights using Workday Web Services. For example, you might enter workday_username.</td>
</tr>
<tr>
<td>Password</td>
<td>Password for the workday_username user.</td>
</tr>
<tr>
<td>Application</td>
<td>Application scope for this credential record. This field is not editable.</td>
</tr>
</tbody>
</table>

4. Click Update.

Configure Workday notifications

You must configure Workday to send notifications to the ServiceNow instance when a new employee is hired, using values that allow the instance to extract the employee identification number.

Administrative privileges on Workday.

Consult the Workday documentation for instructions on performing these procedures.

**Important:** The values configured in the Workday notification must match values configured on the ServiceNow instance. For details about configuring the ServiceNow instance to receive Workday notifications and parse the data for the employee ID, see Employee Orchestration properties on page 1831.

1. Set up email alerts based on the completion of a process on Workday.
   a) In Notification Delivery Settings, ensure that Custom Business Process Notifications is enabled and set to Immediate.
   b) Go to your company's Hire business process and either add a new notification or open an existing notification for edit.
   c) Provide this information for the notification.

Table 665: Workday notification information

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trigger on Status</td>
<td>Set to Completed.</td>
</tr>
<tr>
<td>Recipients</td>
<td>Provide the email ID of the ServiceNow instance, such as <a href="mailto:acme@service-now.com">acme@service-now.com</a>.</td>
</tr>
<tr>
<td>Text</td>
<td>In the Message Content form, provide the Subject content. Employee Orchestration is configured to look for Workday Notification - Employee Hired in the subject line of the notification. This value must match the email trigger that launches the Employee Orchestration workflow.</td>
</tr>
</tbody>
</table>
2. Hire the person for an open position and provide information such as the employee’s address and email ID. This is the data that the Employee Orchestration workflow returns to the instance and uses to populate the sys_user table.

**Employee Orchestration properties**

The Employee Orchestration properties allow a ServiceNow® instance to receive notifications from Workday and to parse the notification for new employee identification numbers.

These properties define important connection settings between the ServiceNow® instance and Workday. Notifications from Workday sent to the email IDs defined here are parsed for the employee ID contained within specified delimiters.

To configure these properties, navigate to Employee Orchestration Properties.

---

**Important:** The values in these properties must match values configured in the Workday notification. For details about configuring Workday to send expected values to a ServiceNow® instance, see Configure Workday notifications on page 1830.

---

**Table 666: Workday properties**

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>workday.email.body.delimiter.start</td>
<td>Email body delimiter start. This is the starting delimiter that sets off the data in a Workday notification that the ServiceNow instance uses to retrieve information about a new employee. For example, you might use #EmpStart#.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: null</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>workday.email.body.delimiter.end</td>
<td>Email body delimiter end. This is the ending delimiter that sets off the employee ID in the Workday notification that the ServiceNow instance uses to retrieve information about a new employee. For example, you might use #EmpEnd#.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: null</td>
</tr>
<tr>
<td>workday.email.sender</td>
<td>List of comma separated email IDs. Workday uses these email IDs to send notifications to the ServiceNow instance when new employees are hired.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: null</td>
</tr>
</tbody>
</table>

Create a Workday email trigger

An email trigger runs an Employee Orchestration workflow when a specific value appears in a Workday notification subject line.

Role required: admin

An email trigger must match the appropriate subject line of an onboarding Workday notification. For example, you can create a trigger that launches the User Provisioning workflow when the ServiceNow instance receives a notification with Workday Notification - Employee Hired in the subject line.

1. Navigate to Employee Orchestration Email triggers and click New.
2. In the Email Subject Line field, enter the content of a Workday notification subject line that you want to use to trigger the User Provisioning workflow.
3. Select a Notification Type of Onboard.

Figure 369: Workday email trigger
4. Click Submit.

Create a new notification type
You can add new Workday notification types to your instance.

Role required: admin

If you add notification types, they must match the Workday notifications exactly. Also, each notification type must be accompanied with a workflow capable of updating ServiceNow® records using the data retrieved from Workday.

1. Navigate to Employee Orchestration Email Triggers and click New.
2. In the new record, add the exact name of the Workday notification you want to have trigger the workflow in the Email Subject Line field.
   For example, you might enter Life Event - Change of Address.
3. Save the record.
4. Right-click the label in the Notification Type field.
5. In the context menu that appears, select Configure Choices.

Figure 370: Configuring the Notification Type choice list

The choice selection lists appear in read-only format.

6. To edit the choice list, click the link in the notice in the header bar.
Figure 371: Edit control for the selection list

The selection form becomes editable.

7. Enter a logical name for the new notification type in the Enter new item field. For example, you might enter Change of address.

8. Click Add.
Figure 372: Adding a new notification type

The system adds the new choice to the Selected list.

9. Click Save to save your new type.

10. In the Email Trigger form, select the new type from the choices in the Notification Type field.
11. Click Update.

**Workday notifications log**

Orchestration keeps a log record of all inbound emails from Workday regarding employee onboarding activities.

Workday notification records show all the information received from Workday for an employee onboarding event. The employee ID of the new employee is contained within delimiters that the ServiceNow instance is configured to recognize. The value in the notification's subject line is configured to trigger the *Orchestration workflow* that retrieves additional employee information from Workday. To access notification records, navigate to Employee Orchestration Notifications.
Figure 373: Sample Workday notification

Delimited content containing the Workday employee ID

Workday email ID configured in system properties

Email trigger that launches the Workday Orchestration workflow
Employee Orchestration workflow

Employee Orchestration provides a default workflow that retrieves employee information from Workday, and then uses that information to update a ServiceNow sys_user record and create an Active Directory account.

The User Provisioning workflow is included with Workday Orchestration. This workflow includes Workday and Active Directory activities that retrieve employee information from Workday, based on the employee's identification number. The workflow then uses this information to create an Active Directory account for the new employee and to ensure that an up-to-date ServiceNow user record exists for that employee.
Figure 374: User Provisioning workflow

Orchestration activity packs

The base Orchestration system includes packs of custom activities you can use to automate typical IT and business processes in your network.
Activity packs allow you to automate several common business processes, such as managing Active Directory accounts and Exchange server mailboxes. Activity packs can also automate IT functions such as starting and stopping Windows servers, joining domains, assigning IP addresses, and configuring load balancers.

Use an activity pack

The Packs tab of the Workflow Editor contains any activity packs downloaded from the ServiceNow Store and any activity packs that you create.

Roles required: admin, activity_admin, activity_creator

You can organize custom activities into packs and upload them to the ServiceNow Store. Your custom packs do not appear in the tree until at least one activity in the pack is published. Activities added to an existing pack are not displayed until they are published. Activity packs from any application scope can appear in the Packs tab, regardless of the current scope setting for the instance.

1. In the Workflow Editor palette, select the Packs tab.
2. Click the download icon.

The hierarchy in the tab organizes packs by vendor, scope, category, and activity.
Active Directory activity pack

The Active Directory (AD) activity pack enables an administrator to create, delete, and manage objects in Windows Active Directory, such as users, groups, and computers, using a ServiceNow Orchestration workflow.

Activities in this pack can reset a password automatically from a user request or manage any user account in Active Directory, whether or not it was created by an Orchestration workflow.

Domain controllers are identified by the IP address of the host machine. To use the hostname of the domain controller, add the Resolve DNS Name activity to resolve the hostname into an IP, and then pass the IP into the Active Directory activity.

Your instance must have access to a MID Server configured to use PowerShell to run these activities.

Note: All Active Directory activities pass through error messages returned from Active Directory. To view these error messages, point to the failed activity in the workflow canvas or select the Workflow Log tab in a Workflow Context record.

Custom Active Directory activities

Orchestration provides custom Active Directory activities that were created with the Orchestration Create a PowerShell activity on page 2055, starting with the Geneva release. These activities perform the same functions as AD activities by the same name from previous releases and replace those activities for all new workflows. Existing workflows from earlier versions that were created with legacy AD activities continue to function normally after an upgrade to Istanbul. However, all new workflows must use these custom AD activities. The Powershell activity template gives workflow administrators the ability to store input and output variables from the Query AD activity in the Databus.

Note: To use the Active Directory custom activities, you must request activation of the Orchestration - Active Directory plugin.

Active Directory credentials with LDAP

If you are using an LDAP Server with MID Servers, note that Orchestration and Active Directory activities do not use the user name and password configured on LDAP Servers. You must create a Windows type orchestration credential record. The username and password in the credentials record is used for LDAP queries that Orchestration and workflow activities perform.

Connection port used by AD Orchestration activities

All Active Directory activities use port 389 for LDAP access. If you are using AD activities with Oracle Virtual Directory (OVD) as a proxy, set up pass-through on port 389 only.

Add User to Group AD activity

The Add User to Group activity adds a user to a group in Windows Active Directory.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Active Directory.
Input variables

Table 667: Add User to Group input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DomainController</td>
<td>IP address of the domain controller machine.</td>
</tr>
<tr>
<td>UserName</td>
<td>Name of the user to add to the group.</td>
</tr>
<tr>
<td>GroupName</td>
<td>Name of the group to which this user is added.</td>
</tr>
</tbody>
</table>

Output variables

Table 668: Add User to Group output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>errorMessage</td>
<td>The executionResult.errorMessages from the Activity designer parsing sources on page 2018.</td>
</tr>
</tbody>
</table>

Conditions

Table 669: Add User to Group conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>User was successfully added to group.</td>
</tr>
<tr>
<td>Failure</td>
<td>An error occurred while attempting to add the user to the group. Additional details may be available in the workflow log.</td>
</tr>
</tbody>
</table>

Change AD User Password activity

The Change AD User Password activity changes the password for an Active Directory user account. This activity requires the user's current password to run, unlike the Reset AD User Password activity. If the new password violates any Active Directory password requirements, such as length or character combinations, the activity fails and returns the appropriate error message. This error message appears in the ECC queue and in hint text when a user points to the activity in the Workflow Editor.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Active Directory.

**Note:** This activity replaces an AD activity by the same name available in prior releases. If you have a workflow that uses the deprecated activity, your workflow will continue to work normally after upgrading to Instanbul. However, all new workflows must use the custom version of this activity, which was built with the PowerShell activity designer on page 1923.
Input variables

Table 670: Change AD User Password input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DomainController</td>
<td>IP address of the domain controller machine.</td>
</tr>
<tr>
<td>User</td>
<td>The sAMAccountName of the Active Directory user account.</td>
</tr>
<tr>
<td>New_password</td>
<td>The new password to assign this user.</td>
</tr>
<tr>
<td>Old_password</td>
<td>The user's current password.</td>
</tr>
</tbody>
</table>

Output variables

Table 671: Change AD User Password output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>One of the following outcomes:</td>
</tr>
<tr>
<td></td>
<td>• failure</td>
</tr>
<tr>
<td></td>
<td>• success</td>
</tr>
<tr>
<td></td>
<td>• Policy Failure</td>
</tr>
<tr>
<td></td>
<td>• Incorrect old password</td>
</tr>
<tr>
<td>errorMessage</td>
<td>The executionResult.errorMessages from the Activity designer parsing sources on page 2018.</td>
</tr>
<tr>
<td>hresult</td>
<td>Powershell command result.</td>
</tr>
</tbody>
</table>

Conditions

The activity provides the following conditions:

Table 672: Change AD User Password conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Password successfully reset.</td>
</tr>
<tr>
<td>Policy Failure</td>
<td>Password does not comply with the organization's Active Directory requirements.</td>
</tr>
<tr>
<td>Incorrect old password</td>
<td>Password being changed was not entered correctly.</td>
</tr>
<tr>
<td>Failure</td>
<td>An error occurred while attempting to change the password. Additional details may be available in the workflow log.</td>
</tr>
</tbody>
</table>
Active Directory credentials with LDAP

If you are using an LDAP Server with MID Servers, note that Orchestration and Active Directory activities do not use the user name and password configured on LDAP Servers. You must create a Windows type orchestration credential record. The username and password in the credentials record is used for LDAP queries that Orchestration and workflow activities perform.

Create AD Object activity

The Create AD Object activity creates an object in Windows Active Directory. This activity fails if it finds an existing object with matching input variables.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Active Directory.

Note: This activity replaces an AD activity by the same name available in prior releases. If you have a workflow that uses the deprecated activity, your workflow will continue to work normally after upgrading to Instanbul. However, all new workflows must use the custom version of this activity, which was built with the PowerShell activity designer on page 1923.

Input variables

Table 673: Create AD Object input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DomainController</td>
<td>IP address of the domain controller machine.</td>
</tr>
<tr>
<td>Type</td>
<td>The object type to create: user, group, or computer.</td>
</tr>
<tr>
<td>OU</td>
<td>The organizational unit to which this object belongs.</td>
</tr>
<tr>
<td>ObjectName</td>
<td>The sAMAccountName of the Active Directory object. Object name is also used for the name attribute in Active Directory. This behavior is available in ActiveDirectory.psm1. Whatever is passed as the Object name becomes both the sAMAccountName and the name of the new user in Active Directory.</td>
</tr>
</tbody>
</table>
### Variable Description

ObjectData

A JSON object containing Active Directory property names and their corresponding values. For example:

```json
{  "givenName" : "John",  "SN" : "Doe",  "title" : "Sr. Account Specialist",  "allowLogin" : true}
```

This example sets the first name (givenName), last name (SN), and title on the Active Directory user account and allows that user to log in (allowLogin). This field allows expression evaluation via the ${} variable substitution syntax.

### Output variables

**Table 674: Create AD Object output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>errorMessage</td>
<td>The executionResult.errorMessages from the Activity designer parsing sources on page 2018.</td>
</tr>
</tbody>
</table>

### Conditions

**Table 675: Create AD Object conditions**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>A Windows Active Directory object was created successfully.</td>
</tr>
<tr>
<td>Failure</td>
<td>An error occurred while attempting to create the AD object. Additional details may be available in the workflow log.</td>
</tr>
</tbody>
</table>

### Disable AD User Account activity

The Disable AD User Account activity disables a Windows Active Directory user account, making it inactive.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Active Directory.
**Note:** This activity replaces an AD activity by the same name available in prior releases. If you have a workflow that uses the deprecated activity, your workflow will continue to work normally after upgrading to Instanbul. However, all new workflows must use the custom version of this activity, which was built with the *PowerShell activity designer* on page 1923.

### Input variables

**Table 676: Disable AD User Account input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DomainController</td>
<td>IP address of the domain controller machine.</td>
</tr>
<tr>
<td>User</td>
<td>The sAMAccountName of the Active Directory user account.</td>
</tr>
</tbody>
</table>

### Output variables

**Table 677: Disable AD User Account output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>errorMessage</td>
<td>The executionResult.errorMessages from the <em>Activity designer parsing sources</em> on page 2018.</td>
</tr>
</tbody>
</table>

### Conditions

**Table 678: Disable AD User Account conditions**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>AD user account was successfully disabled.</td>
</tr>
<tr>
<td>Failure</td>
<td>An error occurred while attempting to disable the account. Additional details may be available in the workflow log.</td>
</tr>
</tbody>
</table>

### Enable AD User Account activity

The Enable AD User Account activity enables a Windows Active Directory user account, making it active.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Active Directory.

**Note:** This activity replaces an AD activity by the same name available in prior releases. If you have a workflow that uses the deprecated activity, your workflow will continue to work normally after...
upgrading to Instanbul. However, all new workflows must use the custom version of this activity, which was built with the *PowerShell activity designer* on page 1923.

### Input variables

**Table 679: Enable AD User Account input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User</td>
<td>The sAMAccountName of the Active Directory user account.</td>
</tr>
<tr>
<td>DomainController</td>
<td>IP address of the domain controller machine.</td>
</tr>
</tbody>
</table>

### Output variables

**Table 680: Enable AD User Account output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>errorMessage</td>
<td>The executionResult.errorMessages from the <em>Activity designer parsing sources</em> on page 2018.</td>
</tr>
</tbody>
</table>

### Conditions

**Table 681: Enable AD User Account conditions**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>AD user account was successfully enabled.</td>
</tr>
<tr>
<td>Failure</td>
<td>An error occurred while attempting to enable the AD user account. Additional details may be available in the workflow log.</td>
</tr>
</tbody>
</table>

### Is AD Account Locked activity

The *Is AD Account Locked* activity determines whether an Active Directory user account is locked. An account may be locked automatically if a user enters an incorrect password more times than allowed by the Active Directory security policy. You can unlock an account using the *Unlock AD User Account* activity.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Active Directory.

**Note:** This activity replaces an AD activity by the same name available in prior releases. If you have a workflow that uses the deprecated activity, your workflow will continue to work normally after
upgrading to Instanbul. However, all new workflows must use the custom version of this activity, which was built with the *PowerShell activity designer* on page 1923.

### Input variables

**Table 682: Is AD Account Locked input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DomainController</td>
<td>IP address of the domain controller machine.</td>
</tr>
<tr>
<td>User</td>
<td>The sAMAccountName of the Active Directory user account.</td>
</tr>
</tbody>
</table>

### Output variables

**Table 683: Is AD Account Locked output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>errorMessage</td>
<td>The executionResult.errorMessages from the <em>Activity designer parsing sources</em> on page 2018.</td>
</tr>
<tr>
<td>output</td>
<td>The query result.</td>
</tr>
</tbody>
</table>

### Conditions

**Table 684: Is AD Account Locked conditions**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locked</td>
<td>The AD account is locked.</td>
</tr>
<tr>
<td>Unlocked</td>
<td>The AD account is unlocked.</td>
</tr>
<tr>
<td>Failure</td>
<td>An error occurred while processing the query. Additional details may be available in the workflow log.</td>
</tr>
</tbody>
</table>

### Query AD activity

The Query AD activity retrieves entries from the Windows Active Directory based on an LDAP search filter and stores the results as a JSON string that can be used in the data bus.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Active Directory.

**Note:** This activity replaces an AD activity by the same name available in releases prior to Geneva. If you have a workflow that uses the deprecated activity, your workflow will continue to
work normally after upgrading to Instanbul and will continue to save query results to the scratchpad. However, all new workflows must use the custom version of this activity. This activity was built with the Create a PowerShell activity on page 2055, which stores input and output variables in the databus instead of the scratchpad.

### Input variables

Table 685: Query AD input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DomainController</td>
<td>IP address of the domain controller machine.</td>
</tr>
<tr>
<td>Properties</td>
<td>A comma-separated list of Active Directory properties to return. For example, givenName,SN,title. If this field is blank, then all properties are returned.</td>
</tr>
<tr>
<td>SearchFilter</td>
<td>An LDAP filter string that defines the search parameters. Use any valid LDAP filtering criteria. For example, to find user accounts matching the ServiceNow input record, use: (samaccountname=${workflow.inputs.u_user.user_name})</td>
</tr>
</tbody>
</table>

### Output variables

Table 686: Query AD output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>errorMessage</td>
<td>The executionResult.errorMessages from the Activity designer parsing sources on page 2018.</td>
</tr>
<tr>
<td>output</td>
<td>The query result.</td>
</tr>
</tbody>
</table>

### Conditions

Table 687: Query AD conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The query completed as expected.</td>
</tr>
<tr>
<td>Failure</td>
<td>An error occurred while processing the query. Additional details may be available in the workflow log.</td>
</tr>
</tbody>
</table>
Remove AD Object activity

The Remove AD Object activity deletes an object from Windows Active Directory.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Active Directory.

**Note:** This activity replaces an AD activity by the same name available in prior releases. If you have a workflow that uses the deprecated activity, your workflow will continue to work normally after upgrading to Instanbul. However, all new workflows must use the custom version of this activity, which was built with the *PowerShell activity designer* on page 1923.

### Input variables

Table 688: Remove AD Object input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DomainController</td>
<td>IP address of the domain controller machine.</td>
</tr>
<tr>
<td>ObjectName</td>
<td>The sAMAccountName of the Active Directory object.</td>
</tr>
<tr>
<td>Type</td>
<td>The object type to remove:</td>
</tr>
<tr>
<td></td>
<td>• user</td>
</tr>
<tr>
<td></td>
<td>• group</td>
</tr>
<tr>
<td></td>
<td>• computer</td>
</tr>
</tbody>
</table>

### Output variables

Table 689: Remove AD Object output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>errorMessage</td>
<td>The executionResult.errorMessages from the <em>Activity designer parsing sources</em> on page 2018.</td>
</tr>
</tbody>
</table>

### Conditions

Table 690: Remove AD Object conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>AD object was successfully removed.</td>
</tr>
</tbody>
</table>
Remove User from Group AD activity

The Remove User from Group activity removes a user from a group in Windows Active Directory.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Active Directory.

Input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DomainController</td>
<td>IP address of the domain controller machine.</td>
</tr>
<tr>
<td>UserName</td>
<td>Name of the user to remove from the group.</td>
</tr>
<tr>
<td>GroupName</td>
<td>Name of the group from which this user is removed.</td>
</tr>
</tbody>
</table>

Output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>errorMessage</td>
<td>The executionResult.errorMessages from the Activity designer parsing sources on page 2018.</td>
</tr>
</tbody>
</table>

Conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>User was successfully removed from the group.</td>
</tr>
<tr>
<td>Failure</td>
<td>An error occurred while attempting to remove the user from the group. Additional details may be available in the workflow log.</td>
</tr>
</tbody>
</table>
Reset AD User Password activity

The Reset AD User Password activity resets the password of a user account in Windows Active Directory. If the new password violates any Active Directory password requirements, such as length or character combinations, the reset activity fails and returns the appropriate error message. This error appears in the ECC Queue and when you point to the activity in the Workflow Editor.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Active Directory.

**Note:** This activity replaces an AD activity by the same name available in prior releases. If you have a workflow that uses the deprecated activity, your workflow will continue to work normally after upgrading to Instanbul. However, all new workflows must use the custom version of this activity, which was built with the PowerShell activity designer on page 1923.

### Input variables

Table 694: Reset AD User Password input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DomainController</td>
<td>IP address of the domain controller machine.</td>
</tr>
<tr>
<td>User</td>
<td>The sAMAccountName of the Active Directory user account.</td>
</tr>
<tr>
<td>Password</td>
<td>The new password for the user. This password must comply with the organization's Active Directory requirements.</td>
</tr>
<tr>
<td>ForceChange</td>
<td>Makes this password temporary by forcing the user to change it at the next login.</td>
</tr>
<tr>
<td>Unlock</td>
<td>Unlock the account if the account is locked.</td>
</tr>
</tbody>
</table>

### Output variables

Table 695: Reset AD User Password output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>One of the following outcomes:</td>
</tr>
<tr>
<td></td>
<td>• failure</td>
</tr>
<tr>
<td></td>
<td>• success</td>
</tr>
<tr>
<td></td>
<td>• Policy Failure</td>
</tr>
<tr>
<td>errorMessage</td>
<td>The executionResult.errorMessages from the Activity designer parsing sources on page 2018.</td>
</tr>
<tr>
<td>hresult</td>
<td>Powershell command result.</td>
</tr>
</tbody>
</table>
Conditions

Table 696: Reset AD User Password conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Password was successfully reset.</td>
</tr>
<tr>
<td>Policy Failure</td>
<td>New password does not comply with the organization's Active Directory requirements.</td>
</tr>
<tr>
<td>Failure</td>
<td>An error occurred while attempting to reset the password. Additional details may be available in the workflow log.</td>
</tr>
</tbody>
</table>

Unlock AD Account activity

The Unlock AD Account activity unlocks a locked Active Directory user account.

You can use the Is AD Account Locked activity on page 1847 activity to determine if an account is locked.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Active Directory.

**Note:** This activity replaces an AD activity by the same name available in prior releases. If you have a workflow that uses the deprecated activity, your workflow will continue to work normally after upgrading to Instanbul. However, all new workflows must use the custom version of this activity, which was built with the PowerShell activity designer on page 1923.

Input variables

Table 697: Unlock AD Account input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DomainController</td>
<td>IP address of the domain controller machine.</td>
</tr>
<tr>
<td>User</td>
<td>The sAMAccountName of the Active Directory user account.</td>
</tr>
</tbody>
</table>

Output variables

Table 698: Unlock AD Account output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>errorMessage</td>
<td>The executionResult.errorMessages from the Activity designer parsing sources on page 2018.</td>
</tr>
</tbody>
</table>
Conditions

Table 699: Unlock AD Account conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The account was successfully unlocked.</td>
</tr>
<tr>
<td>Failure</td>
<td>An error occurred while attempting to unlock the account. Additional details may be available in the workflow log.</td>
</tr>
</tbody>
</table>

Update AD Object activity

The Update AD Object activity updates an object in Windows Active Directory. This activity only replaces existing values with new values. It cannot add new values to AD records such as adding a new group member to an AD group. For complex AD operations, use the Run PowerShell activity instead. The activity fails if it cannot find an existing account with matching object name and data.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Active Directory.

**Note:** This activity replaces an AD activity by the same name available in prior releases. If you have a workflow that uses the deprecated activity, your workflow will continue to work normally after upgrading to Instanbul. However, all new workflows must use the custom version of this activity, which was built with the PowerShell activity designer on page 1923.

Input variables

Table 700: Update AD Object input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DomainController</td>
<td>IP address of the domain controller machine.</td>
</tr>
<tr>
<td>ObjectName</td>
<td>The sAMAccountName of the Active Directory object.</td>
</tr>
</tbody>
</table>
| ObjectData     | A JSON object containing Active Directory properties and their values. For example, to set the first name, last name, and title of a user, clear the user’s manager, and set the VIP flag to true, the Object Data specifies:  

```json
{ "givenName" : "John", "SN" : "Doe", "title" : "Sr. Account Specialist", "manager" : null, "msTSAllowLogon" : false }
```

| Type            | The object type to update: user, group, or computer.                        |
Output variables

Table 701: Update AD Object output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>errorMessage</td>
<td>The executionResult.errorMessages from the Activity designer parsing sources on page 2018.</td>
</tr>
</tbody>
</table>

Conditions

Table 702: Update AD Object conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>AD object was successfully updated.</td>
</tr>
<tr>
<td>Failure</td>
<td>An error occurred while attempting to update an AD object. Additional details may be available in the workflow log.</td>
</tr>
</tbody>
</table>

Azure AD activity pack

The Azure AD activity pack enables an administrator to automate employee onboarding and offboarding functions on Azure AD and manage Office 365 licensing.

Use the Azure AD activities to add and remove users to Azure Active Directory, manage security group membership, and assign or remove Office 365 licenses for individual users.

The Azure AD activities were created with the Orchestration REST Web Service activity template.

Add User to Group Azure AD activity

The Add User to Group activity adds a user to an existing security group in Azure Active Directory.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Azure AD. This activity was built with the REST web service activity template.

Important: The REST message used for this activity must be configured to use OAuth2 authentication.

Input variables

Table 703: Add User to Group input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>user_id</td>
<td>Object ID (GUID) of the member to be added.</td>
</tr>
</tbody>
</table>
Output variables

Table 704: Add User to Group output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>group_id</td>
<td>Object ID (GUID) of the target group.</td>
</tr>
</tbody>
</table>

Conditions

Table 705: Add User to Group conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully added the object ID to the security group.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to update the group's membership, or the activity failed to connect to Azure AD.</td>
</tr>
</tbody>
</table>

Assign User License Azure AD activity

The Assign User License activity assigns an additional Office 365 software license to the named user.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Azure AD. This activity was built with the REST web service activity template.

Important: The REST message used for this activity must be configured to use OAuth2 authentication.
Input variables

Table 706: Assign User License input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>user_id</td>
<td>The object ID (GUID) or the user principal name of the target user. An example of a user principal name is <a href="mailto:someuser@a830edad9050849NDA1.onmicrosoft.com">someuser@a830edad9050849NDA1.onmicrosoft.com</a>.</td>
</tr>
<tr>
<td>sku_id</td>
<td>Subscription SKU ID associated with the tenant's enterprise agreement.</td>
</tr>
</tbody>
</table>

Output variables

Table 707: Assign User License output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>error</td>
<td>Returns the error string from the REST message. If there are no errors, this variable returns a null value.</td>
</tr>
<tr>
<td>body</td>
<td>Contains a string value representing the output from the REST message.</td>
</tr>
<tr>
<td>status_code</td>
<td>Contains the status code returned from the Web service.</td>
</tr>
</tbody>
</table>

Conditions

Table 708: Assign User License conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully assigned an Office 365 license to a user.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to assigned an Office 365 license to a user, or the activity failed to connect to Azure AD.</td>
</tr>
</tbody>
</table>

Create User Azure AD activity

The Create User activity creates a user for the Azure Active Directory tenant.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Azure AD. This activity was built with the REST web service activity template.
**Important:** The REST message used for this activity must be configured to use **OAuth2 authentication**.

---

**Input variables**

**Table 709: Create User input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>display_name</td>
<td>Name of the Azure AD user in the accepted display format, such as jacinto.gawron.</td>
</tr>
<tr>
<td>user_principal_name</td>
<td>User principal name (UPN) in an email format. For example, you might enter <a href="mailto:jacinto.gawron@khitomer.com">jacinto.gawron@khitomer.com</a>.</td>
</tr>
<tr>
<td>mail_nickname</td>
<td>User's email alias that redirects to the user's full address.</td>
</tr>
<tr>
<td>password</td>
<td>User's Azure AD password. This password must be passed as a workflow input with a type of Password (2 Way Encrypted) and must meet the password policy set in Azure AD.</td>
</tr>
<tr>
<td>change_password</td>
<td>Control that requires the user to change his or her password at the next login, if set to true.</td>
</tr>
<tr>
<td>account_enabled</td>
<td>Control that sets the user's account is enabled, if set to true.</td>
</tr>
<tr>
<td>given_name</td>
<td>First name of the user.</td>
</tr>
<tr>
<td>surname</td>
<td>Last name of the user.</td>
</tr>
<tr>
<td>other_mails</td>
<td>List of additional email addresses for the user. For example, you might enter &quot;<a href="mailto:jac@home.com">jac@home.com</a>&quot;, &quot;<a href="mailto:jgawron@fabrikam.com">jgawron@fabrikam.com</a>&quot;.</td>
</tr>
<tr>
<td>country</td>
<td>The country or region in which the user is located. For example, you might enter US or UK. The default value is set to US.</td>
</tr>
<tr>
<td>city</td>
<td>City in which the user is located.</td>
</tr>
<tr>
<td>department</td>
<td>Name of the department in which the user works.</td>
</tr>
<tr>
<td>mobile</td>
<td>User's primary cell phone number.</td>
</tr>
<tr>
<td>job_title</td>
<td>User's job title.</td>
</tr>
<tr>
<td>physical_delivery_office_name</td>
<td>Office location in the user place of business.</td>
</tr>
<tr>
<td>postal_code</td>
<td>Postal code of the user's address.</td>
</tr>
<tr>
<td>preferred_language</td>
<td>Language in which the user prefers to communicate. This value must follow the ISO 639-1 Code. For example, you might enter en-US. The default value is set to en-US.</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>state</td>
<td>State or province for the user's address.</td>
</tr>
<tr>
<td>street_address</td>
<td>Street address of the user's place of business.</td>
</tr>
<tr>
<td>telephone_number</td>
<td>Primary telephone number of the user's place of business.</td>
</tr>
<tr>
<td>usage_location</td>
<td>Two letter country code that is required for users who are assigned Office 365 licenses. The default value is US.</td>
</tr>
</tbody>
</table>

**Output variables**

Table 710: Create User output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>error</td>
<td>Returns the error string from the REST message. If there are no errors, this variable returns a null value.</td>
</tr>
<tr>
<td>status_code</td>
<td>Contains the status code returned from the Web service.</td>
</tr>
<tr>
<td>user_exists</td>
<td>Output variable mapped to the JSON message that contains the User already exists error.</td>
</tr>
</tbody>
</table>
| user_info    | The user_info array contains attributes that can be leveraged by other activities as inputs. For example, the user objectid output (GUID) can be passed to the Add User to Group activity as the user_id input.  
- objectid: User's Azure AD identifier.  
- accountEnabled: Boolean variable indicating whether the user's account is active or inactive.  
- displayName: Users display name, such as jacinto.gawron.  
- userPrincipalName: User's name in email format, such as jacinto.gawron@wammo.com.  
- mailNickname: User's email alias. |

**Conditions**

Table 711: Create User conditions

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Created user</td>
<td>Activity successfully created the user.</td>
</tr>
</tbody>
</table>
## Conditions

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User already exists</td>
<td>User already exists in the tenant domain.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to connect to Azure AD, or an input value was invalid.</td>
</tr>
</tbody>
</table>

## Delete User Azure AD activity

The Delete User activity deletes the named user’s account from the Azure Active Directory tenant.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Azure AD. This activity was built with the REST web service activity template.

**Important:** The REST message used for this activity must be configured to use OAuth2 authentication.

### Input variables

#### Table 712: Delete User input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>user_id</td>
<td>The object ID (GUID) or the user principal name of the target user. An example of a user principal name is <a href="mailto:someuser@a830edad9050849NDA1.onmicrosoft.com">someuser@a830edad9050849NDA1.onmicrosoft.com</a>.</td>
</tr>
</tbody>
</table>

### Output variables

#### Table 713: Delete User output variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>error</td>
<td>Returns the error string from the REST message. If there are no errors, this variable returns a null value.</td>
</tr>
<tr>
<td>body</td>
<td>Contains a string value representing the output from the REST message.</td>
</tr>
<tr>
<td>status_code</td>
<td>Contains the status code returned from the Web service.</td>
</tr>
</tbody>
</table>
Conditions

Table 714: Delete User conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deleted user</td>
<td>Activity deleted the specified user.</td>
</tr>
<tr>
<td>User does not exist</td>
<td>Specified user does not have an account in the tenant domain.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to connect to Azure AD.</td>
</tr>
</tbody>
</table>

Get User Info Azure AD activity

The Get User Info activity returns the named user's information from the Azure Active Directory.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Azure AD. This activity was built with the REST web service activity template.

Important: The REST message used for this activity must be configured to use OAuth2 authentication.

Input variables

Table 715: Check If User Exists input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>user_id</td>
<td>The object ID (GUID) or the user principal name of the target user. An example of a user principal name is <a href="mailto:someuser@a830edad9050849NDA1.onmicrosoft.com">someuser@a830edad9050849NDA1.onmicrosoft.com</a></td>
</tr>
</tbody>
</table>

Note: Version 2 of this activity enforces input validation. If empty, the following message appears: "Mandatory input 'user_id' is empty".

Output variables

Table 716: Check If User Exists output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>error</td>
<td>Returns the error string from the REST message. If there are no errors, this variable returns a null value.</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>body</td>
<td>Contains a string value representing the output from the REST message.</td>
</tr>
<tr>
<td>status_code</td>
<td>Contains the status code returned from the Web service.</td>
</tr>
<tr>
<td>user_info</td>
<td>The user_info array contains attributes that can be leveraged by other activities as inputs. For example, the user objectid output (GUID) can be passed to the Add User to Group activity as the user_id input.</td>
</tr>
<tr>
<td></td>
<td>• objectid: User's Azure AD identifier.</td>
</tr>
<tr>
<td></td>
<td>• accountEnabled: Boolean variable indicating whether the user's account is active or inactive.</td>
</tr>
<tr>
<td></td>
<td>• displayName: Users display name, such as jacinto.gawron.</td>
</tr>
<tr>
<td></td>
<td>• userPrincipalName: User's name in email format, such as <a href="mailto:jacinto.gawron@wammo.com">jacinto.gawron@wammo.com</a>.</td>
</tr>
<tr>
<td></td>
<td>• mailNickname: User's email alias.</td>
</tr>
</tbody>
</table>

### Conditions

**Table 717: Check If User Exists conditions**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User exists</td>
<td>Activity found the named user.</td>
</tr>
<tr>
<td>User does not exist</td>
<td>Activity was unable to find the named user in the customer tenant domain.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to connect to Azure AD.</td>
</tr>
</tbody>
</table>

### Remove User from Group Azure AD activity

The Remove User from Group activity removes an existing user from a security group in Azure Active Directory.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Azure AD. This activity was built with the REST web service activity template.

**Important:** The REST message used for this activity must be configured to use OAuth2 authentication.
Input variables

Table 718: Remove User from Group input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>user_id</td>
<td>Object ID (GUID) of the user to be removed.</td>
</tr>
<tr>
<td>group_id</td>
<td>Object ID (GUID) of the target group.</td>
</tr>
</tbody>
</table>

Output variables

Table 719: Remove User from Group output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>error</td>
<td>Returns the error string from the REST message. If there are no errors, this variable returns a null value.</td>
</tr>
<tr>
<td>body</td>
<td>Contains a string value representing the output from the REST message.</td>
</tr>
<tr>
<td>status_code</td>
<td>Contains the status code returned from the Web service.</td>
</tr>
</tbody>
</table>

Conditions

Table 720: Remove User from Group conditions

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity removed the object ID from the security group.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to update the group's membership, or the activity failed to connect to Azure AD.</td>
</tr>
</tbody>
</table>

Remove User License Azure AD activity

The Remove User License activity revokes the specified Office 365 software license for the named user.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Azure AD. This activity was built with the REST web service activity template.

Important: The REST message used for this activity must be configured to use OAuth2 authentication.
Input variables

Table 721: Remove User License input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>user_id</td>
<td>The object ID (GUID) or the user principal name of the target user. An example of a user principal name is <a href="mailto:someuser@a830edad9050849NDA1.onmicrosoft.com">someuser@a830edad9050849NDA1.onmicrosoft.com</a>.</td>
</tr>
<tr>
<td>sku_id</td>
<td>Subscription SKU ID associated with the tenant's enterprise agreement.</td>
</tr>
</tbody>
</table>

Output variables

Table 722: Remove User License output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>error</td>
<td>Returns the error string from the REST message. If there are no errors, this variable returns a null value.</td>
</tr>
<tr>
<td>body</td>
<td>Contains a string value representing the output from the REST message.</td>
</tr>
<tr>
<td>status_code</td>
<td>Contains the status code returned from the Web service.</td>
</tr>
</tbody>
</table>

Conditions

Table 723: Remove User License conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity removed an Office 365 license from the named user.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to remove an Office 365 from a user, or the activity failed to connect to Azure AD.</td>
</tr>
</tbody>
</table>

Reset User Password Azure AD activity

The Reset User Password activity changes the named user's Azure Active Directory password. The Azure password policy imposes constraints on the complexity, length, and re-use of a password. To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Azure AD. This activity was built with the REST web service activity template.
Important: The REST message used for this activity must be configured to use OAuth2 authentication.

Input variables

Table 724: Reset User Password input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>user_id</td>
<td>The object ID (GUID) or the user principal name of the target user. An example of a user principal name is <a href="mailto:someuser@a830edad9050849NDA1.onmicrosoft.com">someuser@a830edad9050849NDA1.onmicrosoft.com</a>.</td>
</tr>
<tr>
<td>password</td>
<td>User's Azure AD password. This password must be passed as a workflow input with a type of Password (2 Way Encrypted) and must meet the password policy set in Azure AD.</td>
</tr>
<tr>
<td>change_password</td>
<td>Control that requires the user to change his or her password at the next login, if set to true.</td>
</tr>
</tbody>
</table>

Output variables

Table 725: Reset User Password output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>error</td>
<td>Returns the error string from the REST message. If there are no errors, this variable returns a null value.</td>
</tr>
<tr>
<td>body</td>
<td>Contains a string value representing the output from the REST message.</td>
</tr>
<tr>
<td>status_code</td>
<td>Contains the status code returned from the Web service.</td>
</tr>
</tbody>
</table>

Conditions

Table 726: Reset User Password conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity reset the named user's password.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to reset the named user's password, or the activity failed to connect to Azure AD.</td>
</tr>
</tbody>
</table>
Exchange activity pack

The Exchange activity pack allows workflows to manage Microsoft Exchange mail systems.

The use of Orchestration Exchange activities requires the following:

- Microsoft Exchange 2010 or 2013.
- A MID Server configured to run Powershell 2.0
- A target Exchange server in the same Active Directory domain as the instance.
- Powershell Remoting enabled on the target Exchange server.

**Note:** These activities cannot be used to interact with Microsoft Exchange Online.

Orchestration provides custom Exchange activities that were created with the Orchestration activity designer template. These activities perform the same functions as Exchange activities by the same name from previous releases and replace those activities for all new workflows. The custom Exchange activities were built with a *Powershell activity template*, which gives workflow administrators the ability to store input and output variables in the *databus*.

**Note:** Existing workflows from earlier versions that were created with legacy Exchange activities continue to function normally after an upgrade to Geneva. However, all new workflows must use these custom Exchange activities.

To use the Microsoft Exchange custom activities, you must *request activation* of the Orchestration - Exchange plugin. The custom Exchange activities are available in the Workflow Editor on the Custom tab. Expand the Custom Activities tree and select the Exchange category for the activity you want to use.
Configure MID Server for Exchange

Configure a MID Server with defined IP ranges to use Exchange.
If the MID Server manages resources within defined IP ranges, instead of all computers on your network, you must perform additional configuration steps to run Exchange activities. You do not need to perform these steps if your MID Server uses the default configuration.

1. In the navigation filter, enter cmdb_ci_dns_name.list.
2. Click New.
3. Enter the fully-qualified domain name (FQDN) of your Exchange server in the Name field.
4. Right-click the form header and select Save.
5. In the IP Address related list, click New.
6. In the IP Address field, enter the IP address of your Exchange server.
7. In the Nic field, select eth0 or your preferred network interface controller.
8. Leave the Netmask field blank.
9. Click Submit.

Pass multivalued properties with an Exchange activity

To set a multivalued property using an Exchange activity, you must use a specific parameter format. The Optional parameters shared input variable allows you to set multivalued properties.

- To set a multivalued property, replacing any existing values, use this format: "PropertyName":"(value1, value2, value3)"
- To add values, use this format: "PropertyName":"+(value1, value2, value3);
- To remove values, use this format: "PropertyName":"-(value1, value2, value3);"
- To both add and remove values, use this format: "PropertyName":"-(value1, value2, value3);+(value1, value2, value3);"

Create Address List activity

The Create Address List activity creates a new address list that acts as an alias for emailing all users in the group.

This alias cannot be used to manage user permissions. This activity implements the Microsoft Exchange New-AddressList command.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Exchange Address List.

Note: This activity replaces an Exchange activity by the same name available in releases prior to Geneva. If you have a workflow created in a previous version that uses the deprecated activity, your workflow will continue to work normally after upgrading to Geneva. However, all new workflows must use the custom version of this activity. This activity was built with the PowerShell activity designer on page 1923, which gives workflow administrators the ability to store input and output variables in the databus.

Input variables

Table 727: Create Address List input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>hostname</td>
<td>The hostname of the Exchange server with which the activity interacts. Do not enter an IP address in this variable.</td>
</tr>
</tbody>
</table>
Variable | Description
---|---
domain | The name of the Exchange server's assigned domain.
nname | Name of the new address list to create.
parameters | Optional parameters to pass to the Exchange server written in JavaScript Object Notation (JSON). Exchange activities cannot pass parameters that reference an object, such as a PSCredential object. Plain text is automatically converted to SecureString objects for parameters that require that data type. Attempting to save an activity that specifies duplicate parameters, including parameters from activity variables, or incorrectly formatted JSON causes a warning message to appear.

**Note:** When passing a switch parameter, such as ForceUpgrade, you must use the format "parameter":"true".

### Output variables

Table 728: Create Address List output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>error</td>
<td>Error message if the operation fails.</td>
</tr>
<tr>
<td>output</td>
<td>Raw XML payload from the Exchange server. This data includes all Exchange attributes.</td>
</tr>
</tbody>
</table>

### Conditions

Table 729: Create Address List conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The activity succeeded in creating a new address list.</td>
</tr>
<tr>
<td>Failure</td>
<td>The activity failed to create a new address list.</td>
</tr>
</tbody>
</table>

### Delete Address List activity

The Delete Address List activity removes an existing address list from an Exchange server.

This activity implements the Microsoft Exchange *Remove-AddressList* command.
To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Exchange Address List.

**Note:** This activity replaces an Exchange activity by the same name available in releases prior to Geneva. If you have a workflow created in a previous version that uses the deprecated activity, your workflow will continue to work normally after upgrading to Geneva. However, all new workflows must use the custom version of this activity. This activity was built with the PowerShell activity designer on page 1923, which gives workflow administrators the ability to store input and output variables in the databus.

### Input variables

**Table 730: Delete Address List input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>hostname</td>
<td>The hostname of the Exchange server with which the activity interacts. Do not enter an IP address in this variable.</td>
</tr>
<tr>
<td>domain</td>
<td>The name of the Exchange server's assigned domain.</td>
</tr>
<tr>
<td>identity</td>
<td>Name of the address list to remove.</td>
</tr>
<tr>
<td>domainController</td>
<td>Fully-qualified domain name (FQDN) of the domain controller that writes to Active Directory.</td>
</tr>
<tr>
<td>recursive</td>
<td>Check box that indicates if the activity should delete Active Directory elements that are children of the specified address list.</td>
</tr>
<tr>
<td>whatif</td>
<td>Check box that indicates if the activity should stage the changes without applying them. Use this variable to test your activity settings before using the activity in a live workflow. When this variable is selected, the Exchange server does not make any changes but indicates if the command would succeed or fail. You can review any messages from the Exchange server using the ECC queue.</td>
</tr>
</tbody>
</table>

### Output variables

**Table 731: Delete Address List output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>error</td>
<td>Error message if the operation fails.</td>
</tr>
</tbody>
</table>
Conditions

Table 732: Delete Address List conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The activity succeeded in removing the address list from the Exchange server.</td>
</tr>
<tr>
<td>Failure</td>
<td>The activity failed to remove the address list from the Exchange server.</td>
</tr>
</tbody>
</table>

Get Address List activity

The Get AddressList activity retrieves all attributes from the specified Exchange address list.

This activity implements the Microsoft Exchange `Get-AddressList` command.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Exchange Address List.

Note: This activity replaces an Exchange activity by the same name available in releases prior to Geneva. If you have a workflow created in a previous version that uses the deprecated activity, your workflow will continue to work normally after upgrading to Geneva. However, all new workflows must use the custom version of this activity. This activity was built with the PowerShell activity designer on page 1923, which gives workflow administrators the ability to store input and output variables in the databus.

Input variables

Table 733: Get Address List input variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>hostname</td>
<td>The hostname of the Exchange server with which the activity interacts. Do not enter an IP address in this variable.</td>
</tr>
<tr>
<td>domain</td>
<td>The name of the Exchange server’s assigned domain.</td>
</tr>
<tr>
<td>domainController</td>
<td>Fully-qualified domain name (FQDN) of the domain controller that writes to Active Directory.</td>
</tr>
<tr>
<td>identity</td>
<td>Name of the address list to get attributes from. If you enter a value in this variable, leave the container and searchText variables blank.</td>
</tr>
<tr>
<td>organization</td>
<td>Organization to which the specified address list belongs.</td>
</tr>
<tr>
<td>searchText</td>
<td>Filter text that causes the activity to return only results that contain this text. This variable can only be used with Exchange 2013 servers. If you enter a value in this variable, leave the container and identity variables blank.</td>
</tr>
</tbody>
</table>
### Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>container</td>
<td>Parent address list of the address list from which you want to retrieve attributes. If you enter a value in this variable, leave the identity and searchText variables blank</td>
</tr>
</tbody>
</table>

### Output variables

#### Table 734: Get Address List output variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>error</td>
<td>Error message if the operation fails.</td>
</tr>
<tr>
<td>output</td>
<td>Raw XML payload from the Exchange server. This data includes all Exchange attributes.</td>
</tr>
</tbody>
</table>

### Conditions

#### Table 735: Get Address List conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The activity succeeded in retrieving the attributes from the address list.</td>
</tr>
<tr>
<td>Failure</td>
<td>The activity failed to retrieve the attributes from the address list.</td>
</tr>
</tbody>
</table>

### Move Address List activity

The Move Address List activity moves a Microsoft Exchange address list to another location in the address hierarchy.

This activity implements the Microsoft Exchange Move-AddressList command.

The Exchange server caches the changes from this activity but does not immediately apply them. Use the Update Address List activity after this activity to apply the changes or wait for the Exchange server to automatically apply cached changes.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Exchange Address List.

**Note:** This activity replaces an Exchange activity by the same name available in releases prior to Geneva. If you have a workflow created in a previous version that uses the deprecated activity, your workflow will continue to work normally after upgrading to Geneva. However, all new workflows must use the custom version of this activity. This activity was built with the PowerShell activity designer on page 1923, which gives workflow administrators the ability to store input and output variables in the databus.
Input variables

Table 736: Move Address List input variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>hostname</td>
<td>The hostname of the Exchange server with which the activity interacts. Do not enter an IP address in this variable.</td>
</tr>
<tr>
<td>domain</td>
<td>The name of the Exchange server's assigned domain.</td>
</tr>
<tr>
<td>identity</td>
<td>Name of the address list to move.</td>
</tr>
<tr>
<td>target</td>
<td>Path to the address list's new location.</td>
</tr>
<tr>
<td>domainController</td>
<td>Fully-qualified domain name (FQDN) of the domain controller that writes to Active Directory.</td>
</tr>
<tr>
<td>whatif</td>
<td>Check box that indicates if the activity should stage the changes without applying them. Use this variable to test your activity settings before using the activity in a live workflow. When this variable is selected, the Exchange server does not make any changes but indicates if the command would succeed or fail. You can review any messages from the Exchange server using the ECC queue.</td>
</tr>
</tbody>
</table>

Output variables

Table 737: Move Address List output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>error</td>
<td>Error message if the operation fails.</td>
</tr>
</tbody>
</table>

Conditions

Table 738: Move Address List conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The activity succeeded in moving the address list to another location.</td>
</tr>
<tr>
<td>Failure</td>
<td>The activity failed to move the address list to another location.</td>
</tr>
</tbody>
</table>
Set Address List activity

The Set Address List activity modifies a Microsoft Exchange address list.

Use the Optional parameters variable to pass specific values to the Microsoft Exchange server. This activity implements the Microsoft Exchange `Set-AddressList` command.

The Exchange server caches the changes from this activity but does not immediately apply them. Use the `Update Address List` after this activity to apply the changes or wait for the Exchange server to automatically apply cached changes.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Exchange Address List.

**Note:** This activity replaces an Exchange activity by the same name available in releases prior to Geneva. If you have a workflow created in a previous version that uses the deprecated activity, your workflow will continue to work normally after upgrading to Geneva. However, all new workflows must use the custom version of this activity. This activity was built with the PowerShell activity designer on page 1923, which gives workflow administrators the ability to store input and output variables in the databus.

### Input variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>hostname</td>
<td>The hostname of the Exchange server with which the activity interacts. Do not enter an IP address in this variable.</td>
</tr>
<tr>
<td>domain</td>
<td>The name of the Exchange server's assigned domain.</td>
</tr>
<tr>
<td>identity</td>
<td>Name of the address list to modify.</td>
</tr>
<tr>
<td>parameters</td>
<td>Optional parameters to pass to the Exchange server written in JavaScript Object Notation (JSON). Exchange activities cannot pass parameters that reference an object, such as a PSCredential object. Plain text is automatically converted to SecureString objects for parameters that require that data type. Attempting to save an activity that specifies duplicate parameters, including parameters from activity variables, or incorrectly formatted JSON causes a warning message to appear. <strong>Note:</strong> When passing a switch parameter, such as ForceUpgrade, you must use the format &quot;parameter&quot;:&quot;true&quot;.</td>
</tr>
</tbody>
</table>
**Output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>error</td>
<td>Error message if the operation fails.</td>
</tr>
</tbody>
</table>

**Conditions**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The activity succeeded in modifying the specified address list.</td>
</tr>
<tr>
<td>Failure</td>
<td>The activity failed to modify the specified address list.</td>
</tr>
</tbody>
</table>

**Update Address List activity**

The Update Address List activity adds or removes users from the specified address list and immediately applies any cached address list changes to the server.

Use the optional parameters variable to specify which users to add or remove. This activity implements the Microsoft Exchange `Update-AddressList` command.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Exchange Address List.

**Note:** This activity replaces an Exchange activity by the same name available in releases prior to Geneva. If you have a workflow created in a previous version that uses the deprecated activity, your workflow will continue to work normally after upgrading to Geneva. However, all new workflows must use the custom version of this activity. This activity was built with the PowerShell activity designer on page 1923, which gives workflow administrators the ability to store input and output variables in the databus.

**Input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>hostname</td>
<td>The hostname of the Exchange server with which the activity interacts. Do not enter an IP address in this variable.</td>
</tr>
<tr>
<td>domain</td>
<td>The name of the Exchange server's assigned domain.</td>
</tr>
</tbody>
</table>
### Output variables

Table 743: Update Address List output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either Success or Failure.</td>
</tr>
<tr>
<td>error</td>
<td>Error message if the operation fails.</td>
</tr>
</tbody>
</table>

### Conditions

Table 744: Update Address List conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The activity succeeded in adding or removing users from the specified address list.</td>
</tr>
<tr>
<td>Failure</td>
<td>The activity failed to add or remove users from the specified address list.</td>
</tr>
</tbody>
</table>

### Create Mailbox activity

The Create Mailbox activity creates a new Active Directory user, if that user does not already exist, and a Microsoft Exchange mailbox for that user.

This activity implements the Microsoft Exchange `New-Mailbox` command.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Exchange Mailbox.

**Note:** This activity replaces an Exchange activity by the same name available in releases prior to Geneva. If you have a workflow created in a previous version that uses the deprecated activity, your workflow will continue to work normally after upgrading to Geneva. However, all new workflows must use the custom version of this activity. This activity was built with the `PowerShell`
activity designer on page 1923, which gives workflow administrators the ability to store input and output variables in the databus.

Input variables

Table 745: Create Mailbox input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>hostname</td>
<td>The hostname of the Exchange server with which the activity interacts. Do not enter an IP address in this variable.</td>
</tr>
<tr>
<td>domain</td>
<td>The name of the Exchange server's assigned domain.</td>
</tr>
<tr>
<td></td>
<td><strong>Important:</strong> The MID Server must be in the same domain as the Exchange server.</td>
</tr>
<tr>
<td>first_name</td>
<td>First name of the user.</td>
</tr>
<tr>
<td>middle_init</td>
<td>Middle initial of the user.</td>
</tr>
<tr>
<td>last_name</td>
<td>Last name of the user.</td>
</tr>
<tr>
<td>alias</td>
<td>The display name for the mailbox address, the part of the email address to the left of the @ symbol. If no alias is specified, the activity uses First name.Last name as the alias. The alias is also used as the user's principal name (UPN) if none is specified in the optional parameters.</td>
</tr>
<tr>
<td>password</td>
<td>Password to use for the new mailbox. The password is encrypted when it is sent to the target host.</td>
</tr>
<tr>
<td>parameters</td>
<td>Optional parameters to pass to the Exchange server written in JavaScript Object Notation (JSON). Exchange activities cannot pass parameters that reference an object, such as a PSCredential object. Plain text is automatically converted to SecureString objects for parameters that require that data type. Attempting to save an activity that specifies duplicate parameters, including parameters from activity variables, or incorrectly formatted JSON causes a warning message to appear.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> When passing a switch parameter, such as ForceUpgrade, you must use the format &quot;parameter&quot;:&quot;true&quot;.</td>
</tr>
</tbody>
</table>
Output variables

Table 746: Create Mailbox output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>error</td>
<td>Error message if the operation fails.</td>
</tr>
<tr>
<td>output</td>
<td>Raw XML payload from the Exchange server.</td>
</tr>
<tr>
<td></td>
<td>This data includes all Exchange attributes.</td>
</tr>
</tbody>
</table>

Conditions

Table 747: Create Mailbox conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The activity succeeded in creating a new mailbox for the specified user.</td>
</tr>
<tr>
<td></td>
<td>If no Active Directory account existed for that user, this activity</td>
</tr>
<tr>
<td></td>
<td>succeeded in creating a new account.</td>
</tr>
<tr>
<td>Failure</td>
<td>The activity failed to create a new mailbox or an Active Directory account</td>
</tr>
<tr>
<td></td>
<td>for the specified user.</td>
</tr>
</tbody>
</table>

Delete Mailbox activity

The Delete Mailbox activity deletes the Microsoft Exchange mailbox of an Active Directory user.

Optional parameters determine how the Exchange server handles the mailbox after deleting the user. This activity implements the Microsoft Exchange `Remove-Mailbox` command.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Exchange Mailbox.

Note: This activity replaces an Exchange activity by the same name available in releases prior to Geneva. If you have a workflow created in a previous version that uses the deprecated activity, your workflow will continue to work normally after upgrading to Geneva. However, all new workflows must use the custom version of this activity. This activity was built with the PowerShell activity designer on page 1923, which gives workflow administrators the ability to store input and output variables in the databus.
### Input variables

#### Table 748: Delete Mailbox input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>hostname</td>
<td>The hostname of the Exchange server with which the activity interacts. Do not enter an IP address in this variable.</td>
</tr>
<tr>
<td>domain</td>
<td>The name of the Exchange server's assigned domain.</td>
</tr>
<tr>
<td>user</td>
<td>Active Directory user to delete. The activity passes this value to Exchange as the Identity Exchange variable.</td>
</tr>
</tbody>
</table>
| parameters | Optional parameters to pass to the Exchange server written in JavaScript Object Notation (JSON). Exchange activities cannot pass parameters that reference an object, such as a PSCredential object. Plain text is automatically converted to SecureString objects for parameters that require that data type. Attempting to save an activity that specifies duplicate parameters, including parameters from activity variables, or incorrectly formatted JSON causes a warning message to appear.  

**Note:** When passing a switch parameter, such as ForceUpgrade, you must use the format "parameter":"true".

### Output variables

#### Table 749: Delete Mailbox output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>error</td>
<td>Error message if the operation fails.</td>
</tr>
</tbody>
</table>
Table 750: Delete Mailbox conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The activity succeeded in deleting the specified user's mailbox.</td>
</tr>
<tr>
<td>Failure</td>
<td>The activity failed to delete the specified user's mailbox.</td>
</tr>
</tbody>
</table>

Disable Mailbox activity

The Disable Mailbox activity disables the mailbox associated with a specified Active Directory account. This activity implements the Microsoft Exchange *Disable-Mailbox* command.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Exchange Mailbox.

**Note:** This activity replaces an Exchange activity by the same name available in releases prior to Geneva. If you have a workflow created in a previous version that uses the deprecated activity, your workflow will continue to work normally after upgrading to Geneva. However, all new workflows must use the custom version of this activity. This activity was built with the *PowerShell activity designer* on page 1923, which gives workflow administrators the ability to store input and output variables in the *databus*.

Input variables

Table 751: Disable Mailbox input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>hostname</td>
<td>The hostname of the Exchange server with which the activity interacts. Do not enter an IP address in this variable.</td>
</tr>
<tr>
<td>domain</td>
<td>The name of the Exchange server's assigned domain.</td>
</tr>
<tr>
<td>user</td>
<td>Active Directory user who's mailbox should be disabled. The activity passes this value to Exchange as the Identity Exchange variable.</td>
</tr>
</tbody>
</table>
Variable | Description
--- | ---
parameters | Optional parameters to pass to the Exchange server written in JavaScript Object Notation (JSON). Exchange activities cannot pass parameters that reference an object, such as a PSCredential object. Plain text is automatically converted to SecureString objects for parameters that require that data type. Attempting to save an activity that specifies duplicate parameters, including parameters from activity variables, or incorrectly formatted JSON causes a warning message to appear.

Note: When passing a switch parameter, such as ForceUpgrade, you must use the format "parameter":"true".

**Output variables**

Table 752: Disable Mailbox output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>error</td>
<td>Error message if the operation fails.</td>
</tr>
</tbody>
</table>

**Conditions**

Table 753: Disable Mailbox conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The activity succeeded in disabling the specified mailbox.</td>
</tr>
<tr>
<td>Failure</td>
<td>The activity failed to disable the specified mailbox.</td>
</tr>
</tbody>
</table>

**Enable Mailbox activity**

The Enable Mailbox activity creates a new mailbox for an existing Active Directory user. This activity implements the Microsoft Exchange *Enable-Mailbox* command.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Exchange Mailbox.

Note: This activity replaces an Exchange activity by the same name available in releases prior to Geneva. If you have a workflow created in a previous version that uses the deprecated
activity, your workflow will continue to work normally after upgrading to Geneva. However, all new workflows must use the custom version of this activity. This activity was built with the *PowerShell activity designer* on page 1923, which gives workflow administrators the ability to store input and output variables in the *databus*.

**Input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>hostname</td>
<td>The hostname of the Exchange server with which the activity interacts. Do not enter an IP address in this variable.</td>
</tr>
<tr>
<td>domain</td>
<td>The name of the Exchange server's assigned domain.</td>
</tr>
<tr>
<td>user</td>
<td>Active Directory user who's mailbox should be enabled. The activity passes this value to Exchange as the Identity Exchange variable.</td>
</tr>
<tr>
<td>parameters</td>
<td>Optional parameters to pass to the Exchange server written in JavaScript Object Notation (JSON). Exchange activities cannot pass parameters that reference an object, such as a PSCredential object. Plain text is automatically converted to SecureString objects for parameters that require that data type. Attempting to save an activity that specifies duplicate parameters, including parameters from activity variables, or incorrectly formatted JSON causes a warning message to appear.</td>
</tr>
</tbody>
</table>

**Note:** When passing a switch parameter, such as ForceUpgrade, you must use the format "parameter":"true".

**Output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>error</td>
<td>Error message if the operation fails.</td>
</tr>
</tbody>
</table>
Conditions

Table 756: Enable Mailbox conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The activity succeeded in creating a new mailbox for the specified user.</td>
</tr>
<tr>
<td>Failure</td>
<td>The activity failed to create a new mailbox for the specified user.</td>
</tr>
</tbody>
</table>

Get Mailbox activity

The Get Mailbox activity gets the mailbox for the specified user or all mailboxes on a Microsoft Exchange server.

This activity implements the Microsoft Exchange *Get-Mailbox* command.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Exchange Mailbox.

**Note:** This activity replaces an Exchange activity by the same name available in releases prior to Geneva. If you have a workflow created in a previous version that uses the deprecated activity, your workflow will continue to work normally after upgrading to Geneva. However, all new workflows must use the custom version of this activity. This activity was built with the *PowerShell activity designer* on page 1923, which gives workflow administrators the ability to store input and output variables in the *databus*.

Input variables

Table 757: Get Mailbox input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>hostname</td>
<td>The hostname of the Exchange server with which the activity interacts. Do not enter an IP address in this variable.</td>
</tr>
<tr>
<td>domain</td>
<td>The name of the Exchange server's assigned domain.</td>
</tr>
<tr>
<td>user</td>
<td>User whose mailbox this activity should retrieve. If no user is specified, the activity gets all mailboxes on the Exchange server. The activity passes this value to Exchange as the Identity Exchange variable.</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| parameters | Optional parameters to pass to the Exchange server written in JavaScript Object Notation (JSON). Exchange activities cannot pass parameters that reference an object, such as a PSCredential object. Plain text is automatically converted to SecureString objects for parameters that require that data type. Attempting to save an activity that specifies duplicate parameters, including parameters from activity variables, or incorrectly formatted JSON causes a warning message to appear.  

**Note:** When passing a switch parameter, such as ForceUpgrade, you must use the format "parameter":"true".

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>error</td>
<td>Error message if the operation fails.</td>
</tr>
<tr>
<td>output</td>
<td>Raw XML payload from the Exchange server. This data includes all Exchange attributes.</td>
</tr>
</tbody>
</table>

### Conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The activity succeeded in retrieving the attributes of the specified mailbox.</td>
</tr>
<tr>
<td>Failure</td>
<td>The activity failed to retrieve the attributes of the specified mailbox.</td>
</tr>
</tbody>
</table>

### Set Mailbox activity

The Set Mailbox activity modifies the settings of an existing Microsoft Exchange mailbox.

Use the optional parameters variable to pass specific values to the Exchange server. This activity implements the Microsoft Exchange *Set-Mailbox* command.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Exchange Mailbox.
Note: This activity replaces an Exchange activity by the same name available in releases prior to Geneva. If you have a workflow created in a previous version that uses the deprecated activity, your workflow will continue to work normally after upgrading to Geneva. However, all new workflows must use the custom version of this activity. This activity was built with the PowerShell activity designer on page 1923, which gives workflow administrators the ability to store input and output variables in the databus.

Input variables

Table 760: Set Mailbox input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>hostname</td>
<td>The hostname of the Exchange server with which the activity interacts. Do not enter an IP address in this variable.</td>
</tr>
<tr>
<td>domain</td>
<td>The name of the Exchange server's assigned domain.</td>
</tr>
<tr>
<td>user</td>
<td>Active Directory user whose mailbox you want to modify. The activity passes this value to Exchange as the Identity Exchange variable.</td>
</tr>
<tr>
<td>parameters</td>
<td>Optional parameters to pass to the Exchange server written in JavaScript Object Notation (JSON). Exchange activities cannot pass parameters that reference an object, such as a PSCredential object. Plain text is automatically converted to SecureString objects for parameters that require that data type. Attempting to save an activity that specifies duplicate parameters, including parameters from activity variables, or incorrectly formatted JSON causes a warning message to appear.</td>
</tr>
</tbody>
</table>

Note: When passing a switch parameter, such as ForceUpgrade, you must use the format "parameter":"true".

Output variables

Table 761: Set Mailbox output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>error</td>
<td>Error message if the operation fails.</td>
</tr>
</tbody>
</table>
Conditions

Table 762: Set Mailbox conditions

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The activity succeeded in modifying the settings of the specified mailbox.</td>
</tr>
<tr>
<td>Failure</td>
<td>The activity failed to modify the settings of the specified mailbox.</td>
</tr>
</tbody>
</table>

F5 Network Management activity pack

Orchestration provides custom activities for configuring elements of an F5 load balancer, including pools, pool members, and the virtual servers contained in the pool.

All F5 custom activities are in the F5 Network Management Application scope and are activated by the Orchestration - F5 network management plugin, which must be activated by request.

ServiceNow provides custom F5 activities, built from the REST web service activity template, that you can use to perform the following tasks:

- Add, delete, or verify pools.
- Add, delete, or identify pool members.
- Add or delete virtual servers.
- Add a profile to a virtual server.
- Configure the virtual server for vlans, irules, pool, and persistence.

Add F5 Pool Member activity

The Add F5 Pool Member activity adds a member to an F5 load balancer pool.

This activity was built using the REST web service activity template. To access the activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Active Directory.

REST settings

- REST message: F5 POOL Membership Management
- REST function: post

Input variables

Table 763: Add F5 Pool Member input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PoolName</td>
<td>Name of this pool, such as testPool.</td>
</tr>
<tr>
<td>F5IPAddress</td>
<td>IP address of the F5 console.</td>
</tr>
</tbody>
</table>
Variable | Description
--- | ---
MemberName | Pool member IP address and port, such as 192.168.2.19:80.

### Output variables

**Table 764: Add F5 Pool Member output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Success or failure.</td>
</tr>
<tr>
<td>status_code</td>
<td>The HTTP status code.</td>
</tr>
<tr>
<td>error</td>
<td>The REST error.</td>
</tr>
<tr>
<td>output</td>
<td>The REST output.</td>
</tr>
</tbody>
</table>

### Conditions

**Table 765: Add F5 Pool Member conditions**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully added an F5 load balancer pool member.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to add an F5 load balancer pool member.</td>
</tr>
</tbody>
</table>

### Get F5 Pool Member activity

The Get F5 Pool Member activity returns the pool members and verifies the pool’s status. Use this activity to verify that a pool member was created properly.

This activity was built using the REST web service activity template. To access the activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Active Directory.

### REST settings

- REST message: F5 POOL Membership Management
- REST function: get
**Input variables**

Table 766: Get F5 Pool Member input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PoolName</td>
<td>Name of this pool, such as testPool.</td>
</tr>
<tr>
<td>F5IPAddress</td>
<td>IP address of the F5 console.</td>
</tr>
</tbody>
</table>

**Output variables**

Table 767: Get F5 Pool Member output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MembersArray</td>
<td>Array for the returned pool member IP address and port, such as 192.168.2.19:80.</td>
</tr>
<tr>
<td>status_code</td>
<td>The HTTP status code.</td>
</tr>
<tr>
<td>error</td>
<td>The REST error.</td>
</tr>
<tr>
<td>result</td>
<td>Success or failure.</td>
</tr>
<tr>
<td>output</td>
<td>The REST output.</td>
</tr>
</tbody>
</table>

**Conditions**

Table 768: Get F5 Pool Member conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully returned the F5 load balancer pool members.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to return the F5 load balancer pool members</td>
</tr>
</tbody>
</table>

**Delete F5 Virtual Server activity**

The Delete F5 Virtual Server activity deletes a virtual server from an F5 load balancer pool.

This activity was built using the REST web service activity template. To access the activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Active Directory.

**REST settings**

- REST message: F5 VIP Management
- REST function: delete
Input variables

Table 769: Delete F5 Virtual Server input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F5IPAddress</td>
<td>IP address of the F5 console.</td>
</tr>
<tr>
<td>name</td>
<td>The virtual server's name, such as testVIP.</td>
</tr>
</tbody>
</table>

Output variables

Table 770: Delete F5 Virtual Server output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Success or failure.</td>
</tr>
<tr>
<td>status_code</td>
<td>The HTTP status code.</td>
</tr>
</tbody>
</table>

Conditions

Table 771: Delete F5 Virtual Server conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully deleted the virtual server from the F5 load balancer pool.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to delete the virtual server from the F5 load balancer pool.</td>
</tr>
</tbody>
</table>

Check F5 Pool activity

The Check F5 Pool activity checks the status of a pool to determine if it is available to accept traffic. Use this activity to determine if a pool you just created is up and running with the proper configuration. This activity was built using the REST web service activity template. To access the activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Active Directory.

REST settings

- REST message: F5 POOL Management
- REST function: get
**Input variables**

Table 772: Check F5 Pool input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F5IPAddress</td>
<td>IP address of the F5 console.</td>
</tr>
<tr>
<td>PoolName</td>
<td>Name of this pool, such as testPool.</td>
</tr>
</tbody>
</table>

**Output variables**

Table 773: Check F5 Pool output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Success or failure.</td>
</tr>
<tr>
<td>status_code</td>
<td>The HTTP status code.</td>
</tr>
<tr>
<td>error</td>
<td>The REST error.</td>
</tr>
</tbody>
</table>

**Conditions**

Table 774: Check F5 Pool conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully returned the status of the F5 load balancer pool.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to return the status of the F5 load balancer pool.</td>
</tr>
</tbody>
</table>

**Add F5 Profile to Virtual Server activity**

The Add F5 Profile to Virtual Server activity adds a profile to a virtual server assigned to an F5 load balancer pool.

This activity was built using the *REST web service activity template*. To access the activity in the Workflow Editor, select the Custom tab, and then navigate to *Custom Activities Active Directory*.

**REST settings**

- REST message: F5 VIP Profile Management
- REST function: post

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Input variables

Table 775: Add F5 Profile to Virtual Server input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>The virtual server's name, such as testVIP</td>
</tr>
<tr>
<td>F5IPAddress</td>
<td>IP address of the F5 console.</td>
</tr>
<tr>
<td>VirtualServerName</td>
<td>Name of the virtual server, such as testVIP.</td>
</tr>
</tbody>
</table>

Output variables

Table 776: Add F5 Profile to Virtual Server output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Success or failure.</td>
</tr>
<tr>
<td>output</td>
<td>The REST output.</td>
</tr>
<tr>
<td>status_code</td>
<td>The HTTP status code.</td>
</tr>
</tbody>
</table>

Conditions

Table 777: Add F5 Profile to Virtual Server conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully added the F5 load balancer profile to the virtual server.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to add the F5 load balancer profile to the virtual server.</td>
</tr>
</tbody>
</table>

Modify F5 Virtual Server activity

The Modify F5 Virtual Server activity configures a virtual server assigned to an F5 load balancer pool with irules and a vlan.

This activity was built using the REST web service activity template. To access the activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Active Directory.

REST settings

- REST message: F5 VIP Management
- REST function: put
Input variables

Table 778: Modify F5 Virtual Server input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>The virtual server's name, such as testVIP.</td>
</tr>
<tr>
<td>F5IPAddress</td>
<td>IP address of the F5 console.</td>
</tr>
<tr>
<td>irules</td>
<td>The irules for the virtual server, such as _sys_https_redirect.</td>
</tr>
<tr>
<td></td>
<td>• pool: Name of the pool for the virtual server, such as testPool.</td>
</tr>
<tr>
<td></td>
<td>• persistent: Persistent profile for the virtual server, such as cookie.</td>
</tr>
<tr>
<td>vlans</td>
<td>Vlans for the virtual server, such as internal.</td>
</tr>
</tbody>
</table>

Output variables

Table 779: Modify F5 Virtual Server output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Success or failure.</td>
</tr>
<tr>
<td>status_code</td>
<td>The HTTP status code.</td>
</tr>
<tr>
<td>output</td>
<td>The REST output.</td>
</tr>
</tbody>
</table>

Conditions

Table 780: Modify F5 Virtual Server conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully configured a virtual server assigned to an F5 load balancer pool.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to configure a virtual server assigned to an F5 load balancer pool.</td>
</tr>
</tbody>
</table>

Add F5 Virtual Server activity

The Add F5 Virtual Server activity adds a virtual server.

This activity was built using the REST web service activity template. To access the activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Active Directory.
REST settings

• REST message: F5 POOL Membership Management
• REST function: post

Input variables

Table 781: Add F5 Virtual Server input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>The virtual server's name, such as testVIP.</td>
</tr>
<tr>
<td>description</td>
<td>Description of this virtual server.</td>
</tr>
<tr>
<td>ipProtocol</td>
<td>Protocol used for this virtual server, such as tcp.</td>
</tr>
<tr>
<td>destination</td>
<td>Virtual server IP address and port number, such as 192.168.4.20:80.</td>
</tr>
<tr>
<td>mask</td>
<td>Subnet mask for this virtual server, such as 255.255.255.255.</td>
</tr>
<tr>
<td>F5IPAddress</td>
<td>IP address of the F5 console.</td>
</tr>
<tr>
<td>sourceAddressTranslation</td>
<td>Source address translation mode.</td>
</tr>
</tbody>
</table>

Output variables

Table 782: Add F5 Virtual Server output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Success or failure.</td>
</tr>
<tr>
<td>status_code</td>
<td>The HTTP status code.</td>
</tr>
<tr>
<td>error</td>
<td>The REST error.</td>
</tr>
<tr>
<td>output</td>
<td>The REST output.</td>
</tr>
</tbody>
</table>

Conditions

Table 783: Add F5 Virtual Server conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully added a virtual server.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to add a virtual server.</td>
</tr>
</tbody>
</table>
Delete F5 Pool Member activity

The Delete F5 Pool Member activity deletes an F5 load balancer pool member.

This activity was built using the REST web service activity template. To access the activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Active Directory.

REST settings

- REST message: F5 POOL Membership Management
- REST function: delete

Input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PoolName</td>
<td>Name of this pool, such as testPool.</td>
</tr>
<tr>
<td>F5IPAddress</td>
<td>IP address of the F5 console.</td>
</tr>
<tr>
<td>MemberName</td>
<td>Pool member IP address and port, such as 192.168.2.19:80.</td>
</tr>
</tbody>
</table>

Output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Success or failure.</td>
</tr>
<tr>
<td>status_code</td>
<td>The HTTP status code.</td>
</tr>
<tr>
<td>error</td>
<td>The REST error.</td>
</tr>
</tbody>
</table>

Conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity succeeded in deleting an F5 load balancer pool member.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to delete an F5 load balancer pool member.</td>
</tr>
</tbody>
</table>
Delete F5 Pool activity

The Delete F5 Pool activity deletes an F5 load balancer pool.

This activity was built using the REST web service activity template. To access the activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Active Directory.

REST settings

- REST message: F5 POOL Management
- REST function: delete

Input variables

Table 787: Delete F5 Pool input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F5IPAddress</td>
<td>IP address of the F5 console.</td>
</tr>
<tr>
<td>PoolName</td>
<td>Name of this pool, such as testPool.</td>
</tr>
</tbody>
</table>

Output variables

Table 788: Delete F5 Pool output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Success or failure.</td>
</tr>
<tr>
<td>error</td>
<td>The REST error.</td>
</tr>
<tr>
<td>status_code</td>
<td>The HTTP status code.</td>
</tr>
</tbody>
</table>

Conditions

Table 789: Delete F5 Pool conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully deleted the F5 load balancer pool.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to delete the F5 load balancer pool.</td>
</tr>
</tbody>
</table>

Add F5 Pool activity

The Add F5 Pool activity creates the F5 load balancer pool.
Use this activity to verify that a pool member was created properly.

This activity was built using the REST web service activity template. To access the activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Active Directory.

REST settings

- REST message: F5 POOL Management
- REST function: post

Input variables

Table 790: Add F5 Pool input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PoolName</td>
<td>Name of this pool, such as testPool.</td>
</tr>
<tr>
<td>F5IPAddress</td>
<td>IP address of the F5 console.</td>
</tr>
<tr>
<td>MemberName</td>
<td>Pool member IP address and port, such as 192.168.2.19:80.</td>
</tr>
</tbody>
</table>

Output variables

Table 791: Add F5 Pool output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Success or failure.</td>
</tr>
<tr>
<td>status_code</td>
<td>The HTTP status code.</td>
</tr>
<tr>
<td>error</td>
<td>The REST error.</td>
</tr>
<tr>
<td>output</td>
<td>The REST output.</td>
</tr>
</tbody>
</table>

Conditions

Table 792: Add F5 Pool conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity succeeded in creating the F5 load balancer pool.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to create the F5 load balancer pool.</td>
</tr>
</tbody>
</table>
Infoblox DDI activity pack

This activity pack supports Infoblox DDI management through ServiceNow Orchestration.

The Infoblox DDI activity pack manages the IP addresses used in a network by integrating DNS and DHCP. Custom Orchestration activities use Infoblox Web API (WAPI) REST web services to access the Infoblox GRID server.

**Important:** Managing IP addresses through the Infoblox server requires a fully functional MID Server.

Starting with the Jakarta release, the Infoblox activity pack updates to version 2. This update supports Infoblox network views, which can restrict the visibility of network data. The view parameter can be passed as a query parameter or payload content, to do operations in a specific view. Version 2 also supports specifying the version of WAPI to use in integration endpoints.

Supported for Infoblox:

- WAPI version 2.0 for REST messages
- NIOS appliance version 7.0

**Note:** To use the Infoblox DDI activities and workflow, you must request activation of the Orchestration - Infoblox DDI Activity Pack plugin.

Create a REST credential for Infoblox activities

All Infoblox activities require a REST credential to manage IP addresses from the Infoblox DDI server.

Before starting this procedure, make sure you have the following:

- A properly configured and running Infoblox DDI Grid Server.
- REST credentials defined on the Infoblox DDI server.

Role required: admin

You must create a REST credential record on the ServiceNow instance that each Infoblox activity can use to access management features on the Infoblox server.

1. Navigate to Orchestration Credentials and click New.
2. In the list of credential types, select Basic Auth Credentials.
3. Create the credential record with a logical name, such as InfobloxCred.
4. Right-click in the header bar of your new credential record and select Copy sys_id from the context menu. Follow browser instructions to copy the sys_id if browser security measures restrict this function.
5. Paste the sys_id into the restCredentials input field of each activity you use.

Infoblox workflows

The Infoblox DDI activity pack includes two default workflows, one that reserves and registers IP addresses and another that releases IP addresses.

To access these workflows, navigate to Workflow Workflow Editor and select the Workflows tab. Click on a workflow to open it, and then click the information icon in the workflow header to display the properties dialog box.
Infoblox Reserve/Register IP in IPAM

Use this workflow to register IPv4 addresses or request the next available IP address on IPAM. Optionally, you can use it to register IP addresses on DNS. The custom Infoblox activities used in this workflow are:

- *IPAM Register IP Address*
- *IPAM Reserve IP Address*
- *Register DNS A-Record*
- *Get Network Details*

**Table 793: Infoblox Reserve/Register IP input variables**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infoblox Server</td>
<td>IP address of the Infoblox DDI server.</td>
</tr>
<tr>
<td>Network</td>
<td>Network containing the target IP address.</td>
</tr>
<tr>
<td>Zone</td>
<td>The DNS zone for the IP address being registered.</td>
</tr>
<tr>
<td>Rest Credentials</td>
<td>The sys_id of the REST credentials from the ServiceNow instance.</td>
</tr>
<tr>
<td>DNS Host Name</td>
<td>Name of the DNS server machine on which the IP address is being registered.</td>
</tr>
<tr>
<td>IPv4 Address</td>
<td>IP address being reserved or registered.</td>
</tr>
</tbody>
</table>

Infoblox Release IPAM Reservations

Use this workflow to release (delete) all the IPAM reservations associated with an IPv4 address. The custom Infoblox activities used in this workflow are:

- *IPAM List IP Reservations*
- *List DNS Record*
- *DNS Delete*
- *IPAM Delete*

**Table 794: Infoblox Release IPAM Reservations input variables**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rest Credentials</td>
<td>The sys_id of the REST credentials from the ServiceNow instance.</td>
</tr>
<tr>
<td>IP to Delete</td>
<td>IP address to release.</td>
</tr>
<tr>
<td>Infoblox Server</td>
<td>IP address of the Infoblox DDI server.</td>
</tr>
</tbody>
</table>

Infoblox roles and permissions

Define the roles and permissions that the Infoblox activities need to access the various resources on the Infoblox server.
Admin groups

There are three types of admin groups on an Infoblox server:

- Superuser
- Default
- Limited Access

To perform specific operations on the Infoblox server, the Limited Access user must have a minimum set of privileges for the desired resources, using either the user interface or an API. These privileges are based on read and read/write access. For more information, refer to the "About Admin Groups" section in the Infoblox NIOS Administrator Guide.

Permission hierarchy

1. User: A user can be part of multiple groups.
2. Group: A group can have many roles.
3. Role: Each role consists of specific resource permissions.

Required permissions

The ServiceNow Infoblox activity pack requires appropriate read and read/write privileges for these resources:

- Network
- DHCP
- DNS
- IPAM

This example shows a default DHCP admin role, its resources, and the related permissions for each.
### Figure 376: Infoblox permissions

<table>
<thead>
<tr>
<th>Group/Role</th>
<th>Permission Type</th>
<th>Resource Type</th>
<th>Permission</th>
</tr>
</thead>
<tbody>
<tr>
<td>DHCP Admin</td>
<td>DHCP Permissions</td>
<td>DHCP Program</td>
<td>Read/Write</td>
</tr>
<tr>
<td></td>
<td></td>
<td>History</td>
<td>Read/Write</td>
</tr>
<tr>
<td>DHCP Admin</td>
<td>All DHCP MAC</td>
<td>DHCP MAC</td>
<td>Read/Write</td>
</tr>
<tr>
<td>DHCP Admin</td>
<td>All DHCP</td>
<td>All DHCP</td>
<td>Read/Write</td>
</tr>
<tr>
<td>DHCP Admin</td>
<td>DHCP Properties</td>
<td>DHCP Properties</td>
<td>Read/Write</td>
</tr>
<tr>
<td>DHCP Admin</td>
<td>DHCP Permissions</td>
<td>IPv4 Lease</td>
<td>Read/Write</td>
</tr>
<tr>
<td></td>
<td></td>
<td>History</td>
<td>Read/Write</td>
</tr>
<tr>
<td>DHCP Admin</td>
<td>All IPv4 DHCP</td>
<td>IPv4 Template</td>
<td>Read/Write</td>
</tr>
<tr>
<td>DHCP Admin</td>
<td>Network Views</td>
<td>Network View</td>
<td>Read/Write</td>
</tr>
<tr>
<td>DHCP Admin</td>
<td>All Permissions</td>
<td>All Permissions</td>
<td>Read/Write</td>
</tr>
</tbody>
</table>
Infoblox DHCP activities

The Infoblox DHCP activities manage the IP addresses reserved for DHCP in your network.

Use these activities to reserve, list, or delete IP addresses that are used for DHCP assignment in your network.

**DHCP Reserve IP v4 Address Range activity**

The DHCP Reserve IP v4 Address Range activity reserves an IP address range for DHCP use.

The DHCP activities use the [REST web service activity template](#) to manage IP addresses using an Infoblox DDI Grid Server. These activities are configured to use a MID Server with REST capabilities.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Infoblox DDI DHCP.

### Input variables

**Table 795: DHCP Reserve IP v4 Address Range input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>InfobloxServer</td>
<td>Name of the Infoblox DDI Grid Server.</td>
</tr>
<tr>
<td>startIpAddress</td>
<td>Beginning IPv4 address of the range to reserve.</td>
</tr>
<tr>
<td>endIpAddress</td>
<td>Ending IPv4 address of the range to reserve.</td>
</tr>
<tr>
<td>restCredentials</td>
<td>The sys_id of the REST credentials from the ServiceNow instance.</td>
</tr>
<tr>
<td>api_version</td>
<td>Defines the version of WAPI to use for the integration endpoints. The default value is 2.0.</td>
</tr>
</tbody>
</table>

**Note:** This field is mandatory. If the field is empty, the orchestration activity will fail.

| View                | Name of the Infoblox network view. The default value is default.            |

**Note:** If the field is empty, the operation is treated as happening in the default view.

### Output variables

**Table 796: DHCP Reserve IP v4 Address Range output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DHCPIpAddressRange</td>
<td>Range of reserved IPv4 addresses.</td>
</tr>
</tbody>
</table>
### Conditions

**Table 797: DHCP Reserve IP v4 Address Range conditions**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully reserved the specified IPv4 address range.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to reserve the specified IPv4 address range.</td>
</tr>
</tbody>
</table>

**DHCP Delete IP Reservation activity**

The DHCP Delete IP Reservation activity deletes IP reservations in DHCP using either an IPv4 or IPv6 address range.

An automation can obtain an Infoblox DHCP object to delete from either of these activities:

- **DHCP List IP Reservations**
- **DHCP Reserve IPv4 Address Range**

The DHCP activities use the *REST web service activity template* to manage IP addresses using an Infoblox DDI Grid Server. These activities are configured to use a MID Server with REST capabilities.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Infoblox DDI DHCP.

### Input variables

**Table 798: DHCP Delete IP Reservation input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>InfobloxServer</td>
<td>Name of the Infoblox DDI Grid Server.</td>
</tr>
<tr>
<td>ipToDelete</td>
<td>IP address range to delete, in the form: range/&lt;encrypted code&gt;:&lt;start range&gt;/&lt;end range&gt;/default</td>
</tr>
<tr>
<td>restCredentials</td>
<td>The sys_id of the REST credentials from the ServiceNow instance.</td>
</tr>
</tbody>
</table>
Variable | Description
---|---
api_version | Defines the version of WAPI to use for the integration endpoints. The default value is 2.0.

**Note:** This field is mandatory. If the field is empty, the orchestration activity will fail.

### Output variables

**Table 799: DHCP Delete IP Reservation output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DHCPDeletedIpRange</td>
<td>Range of deleted IP addresses.</td>
</tr>
<tr>
<td>error</td>
<td>Displays the message for any REST error encountered.</td>
</tr>
</tbody>
</table>

### Conditions

**Table 800: DHCP Delete IP Reservation conditions**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully deleted the specified IP address range.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to delete the specified IP address range.</td>
</tr>
</tbody>
</table>

**DHCP List IP Reservations activity**
The DHCP List IP Reservations activity generates a list of all the DHCP range reservations on a specific InfoBlox server.

The DHCP activities use the REST web service activity template to manage IP addresses using an InfoBlox DDI Grid Server. These activities are configured to use a MID Server with REST capabilities.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities InfoBlox DDI DHCP.

### Input variables

**Table 801: DHCP List IP Reservations input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>InfobloxServer</td>
<td>Name of the InfoBlox DDI Grid Server.</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>restCredentials</td>
<td>The sys_id of the REST credentials from the ServiceNow instance.</td>
</tr>
</tbody>
</table>
| api_version  | Defines the version of WAPI to use for the integration endpoints. The default value is 2.0.  
                  **Note:** This field is mandatory. If field is empty, the orchestration activity will fail. |
| view         | Name of the Infoblox network view. The default value is default.             
                  **Note:** If the field is empty, the operation is treated as happening with no view and returns the values with data from all views. |

### Output variables

**Table 802: DHCP List IP Reservations output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>reference</td>
<td>Reference value for an array of DHCP address ranges in this format: range/&lt;encrypted code&gt;:&lt;start range&gt;/&lt;end range&gt;/default</td>
</tr>
<tr>
<td>network</td>
<td>Address of the network containing the IP address range.</td>
</tr>
<tr>
<td>network_view</td>
<td>Routing domain associated with the network returned.</td>
</tr>
</tbody>
</table>

### Conditions

**Table 803: DHCP List IP Reservations conditions**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully returned an array of DHCP IP address ranges.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to return an array of DHCP IP address ranges.</td>
</tr>
</tbody>
</table>

### Infoblox DNS activities

The Infoblox DNS activities manage DNS records in your network using an Infoblox DDI Grid Server. Use these activities to register, list, or delete DNS records managed on an Infoblox server.
**List DNS C-records activity**
The List DNS C-records activity retrieves all canonical (CNAME) records from a specified Infoblox server.

The DNS activities use the REST web service activity template to manage DNS records using an Infoblox DDI Grid Server. These activities are configured to use a MID Server with REST capabilities.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Infoblox DDI DNS.

**Input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>InfobloxServer</td>
<td>Name of the Infoblox DDI Grid Server.</td>
</tr>
<tr>
<td>restCredentials</td>
<td>The sys_id of the REST credentials from the ServiceNow instance.</td>
</tr>
<tr>
<td>api_version</td>
<td>Defines the version of WAPI to use for the integration endpoints. The default value is 2.0. Note: This field is mandatory. If field is empty, the orchestration activity will fail.</td>
</tr>
<tr>
<td>view</td>
<td>Name of the Infoblox network view. The default value is default. Note: If the field is empty, the operation is treated as happening with no view and returns the values with data from all views.</td>
</tr>
</tbody>
</table>

**Output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>error</td>
<td>Displays the message for any REST error encountered.</td>
</tr>
<tr>
<td>reference</td>
<td>Reference value for a DNS CNAME record, such as: record:cname/ ZG5zLmJpbnRFy25hbWUkJkI9kZjdWx0LmNvbS50ZWN0LmRv</td>
</tr>
<tr>
<td>cannonicalName</td>
<td>CNAME record.</td>
</tr>
<tr>
<td>name</td>
<td>Name of the network option returned, such as domain-name-server.</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
</tr>
<tr>
<td>view</td>
<td>The assigned view of the DNS data. A given zone can have multiple views, which are accessed depending on the IP address of the source of the query. The default view of DNS data for this activity is the network view.</td>
</tr>
</tbody>
</table>

### Conditions

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully listed the DNS C records.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to list the DNS C records.</td>
</tr>
</tbody>
</table>

**Register DNS A-record activity**
The Register DNS A-record activity creates a DNS A record on a specified Infoblox server.

The DNS activities use the REST web service activity template to manage DNS records using an Infoblox DDI Grid Server. These activities are configured to use a MID Server with REST capabilities.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Infoblox DDI DNS.

### Input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>InfobloxServer</td>
<td>Name of the Infoblox DDI Grid Server.</td>
</tr>
<tr>
<td>network</td>
<td>Address of the network containing the IP address to register in the record.</td>
</tr>
<tr>
<td>hostName</td>
<td>Name of the actual server machine associate with the IP address in this record.</td>
</tr>
<tr>
<td>zone</td>
<td>The DNS zone associated with the record being created.</td>
</tr>
<tr>
<td>ipAddress</td>
<td>Specific IP address registered in this record.</td>
</tr>
<tr>
<td>restCredentials</td>
<td>The sys.id of the REST credentials from the ServiceNow instance.</td>
</tr>
</tbody>
</table>
London    ServiceNow    Now Platform Capabilities

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>api_version</td>
<td>Defines the version of WAPI to use for the integration endpoints. The default value is 2.0. <strong>Note:</strong> This field is mandatory. If the field is empty, the orchestration activity will fail.</td>
</tr>
<tr>
<td>view</td>
<td>Name of the Infoblox network view. The default value is default. <strong>Note:</strong> If the field is empty, the operation is treated as happening in the default view.</td>
</tr>
</tbody>
</table>

### Output variables

**Table 808: Register DNS A-record output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>error</td>
<td>Displays the message for any REST error encountered.</td>
</tr>
<tr>
<td>DNSARRecord</td>
<td>Name of the record registered, expressed in the format: record:host/&lt;encrypted code&gt;:&lt;network name&gt;/default.</td>
</tr>
</tbody>
</table>

### Conditions

**Table 809: Register DNS A-record conditions**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully created the DNS A record.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to create the DNS A record.</td>
</tr>
</tbody>
</table>

**Register DNS C-Record activity**

The Register DNS C-Record activity creates a DNS canonical (CNAME) record on a specified Infoblox server.

The DNS activities use the REST web service activity template to manage DNS records using an Infoblox DDI Grid Server. These activities are configured to use a MID Server with REST capabilities.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Infoblox DDI DNS.
### Input variables

**Table 810: Register DNS C-Record input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>InfobloxServer</td>
<td>Name of the Infoblox DDI Grid Server.</td>
</tr>
<tr>
<td>cname</td>
<td>The DNS canonical record to create, as expressed by the c_name value.</td>
</tr>
<tr>
<td>recordName</td>
<td>Name of the record to create.</td>
</tr>
<tr>
<td>zone</td>
<td>The DNS zone containing the canonical record to create.</td>
</tr>
<tr>
<td>restCredentials</td>
<td>The sys_id of the REST credentials from the ServiceNow instance.</td>
</tr>
<tr>
<td>api_version</td>
<td>Defines the version of WAPI to use for the integration endpoints. The default value is 2.0.</td>
</tr>
</tbody>
</table>

**Note:** This field is mandatory. If the field is empty, the orchestration activity will fail.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>view</td>
<td>Name of the Infoblox network view. The default value is default.</td>
</tr>
</tbody>
</table>

**Note:** If the field is empty, the operation is treated as happening in the default view.

### Output variables

**Table 811: Register DNS C-Record output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>error</td>
<td>Displays the message for any REST error encountered.</td>
</tr>
<tr>
<td>DNSCCRecord</td>
<td>Name of the CNAME record registered, expressed in the format: record:cname/&lt;encrypted code&gt;:&lt;network name&gt;/default.</td>
</tr>
</tbody>
</table>
Conditions

### Table 812: Register DNS C-Record conditions

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully created the canonical DNS record.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to create the canonical DNS record.</td>
</tr>
</tbody>
</table>

**List DNS Record activity**

The List DNS Record activity generates a list of all the DNS entries on a specific InfoBlox server.

The DNS activities use the *REST web service activity* template to manage DNS records using an InfoBlox DDI Grid Server. These activities are configured to use a MID Server with REST capabilities.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Infoblox DDI DNS.

**Input variables**

### Table 813: List DNS Record input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>InfobloxServer</td>
<td>Name of the Infoblox DDI Grid Server.</td>
</tr>
<tr>
<td>restCredentials</td>
<td>The sys_id of the REST credentials from the ServiceNow instance.</td>
</tr>
<tr>
<td>api_version</td>
<td>Defines the version of WAPI to use for the integration endpoints. The default value is 2.0.</td>
</tr>
</tbody>
</table>

**Note:** This field is mandatory. If field is empty, the orchestration activity will fail.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>view</td>
<td>Name of the Infoblox network view. The default value is default.</td>
</tr>
</tbody>
</table>

**Note:** If the field is empty, the operation is treated as happening with no view and returns the values with data from all views.
### Output variables

Table 814: List DNS Record output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>reference</td>
<td>Reference value for a DNS record, such as: record:cname/ZG5zLmJpbmRfY25hbWUkLi9kZWZhdWx0LmNvbS50ZXN0LmNuYW1l:cname.test.com/default</td>
</tr>
<tr>
<td>configure_for_dhcp</td>
<td>Returns the status of a DHCP fixed address object.</td>
</tr>
<tr>
<td>host</td>
<td>Host machine with which the DNS record is associated.</td>
</tr>
<tr>
<td>ipv4addr</td>
<td>The reserved IPv4 address associated with a DNS record.</td>
</tr>
<tr>
<td>name</td>
<td>Name of the network option returned. For example, the name of the DNS record object from the reference example is cname.test.com.</td>
</tr>
<tr>
<td>view</td>
<td>The assigned view of the DNS data. A given zone can have multiple views, which are accessed depending on the IP address of the source of the query. The default view of DNS data for this activity is the network view.</td>
</tr>
<tr>
<td>error</td>
<td>Displays the message for any REST error encountered.</td>
</tr>
</tbody>
</table>

### Conditions

Table 815: List DNS Record conditions

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully listed all the available DNS record.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to list the available DNS record.</td>
</tr>
</tbody>
</table>

**DNS Delete activity**

The DNS Delete activity deletes DNS records of any type from in Infoblox server, such as C and A records.

The DNS activities use the _REST web service activity_ template to manage DNS records using an Infoblox DDI Grid Server. These activities are configured to use a MID Server with REST capabilities.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Infoblox DDI DNS.

**Note:** It is faster to create a new record than recover one that has been deleted.
Input variables

Table 816: DNS Delete input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>InfobloxServer</td>
<td>Name of the Infoblox DDI Grid Server.</td>
</tr>
<tr>
<td>RecordToDelete</td>
<td>Name of the DNS record to delete. The record is expressed in this format:</td>
</tr>
<tr>
<td></td>
<td>record:cname/09ZG5zLmJpbmRfY25hbWUkLi9kZWZhdWx0LmNvbS50ZXN0LmNuYW1l:cname.test.com/default</td>
</tr>
<tr>
<td>restCredentials</td>
<td>The sys_id of the REST credentials from the ServiceNow instance.</td>
</tr>
<tr>
<td>api_version</td>
<td>Defines the version of WAPI to use for the integration endpoints. The default value is 2.0.</td>
</tr>
</tbody>
</table>

Note: This field is mandatory. If the field is empty, the orchestration activity will fail.

Output variables

Table 817: DNS Delete output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DeletedRecord</td>
<td>Name of the deleted DNS record.</td>
</tr>
<tr>
<td>error</td>
<td>Displays the message for any REST error encountered.</td>
</tr>
</tbody>
</table>

Conditions

Table 818: DNS Delete conditions

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully deleted the specified DNS record.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to delete the specified DNS record.</td>
</tr>
</tbody>
</table>

Infoblox IPAM activities

The Infoblox IPAM activities manage IP addresses in your network using an Infoblox DDI Grid Server.
Use these activities to register, reserve, list, or delete IP addresses.

**IPAM Register IP Address activity**

The IPAM Register IP Address activity registers an IP address in a network using Infoblox IPAM.

The output of this activity produces an InfoBlox IP address record that can be used for other IPAM functions in the format fixedaddress/<encrypted key>:<reserved ip address>/<view>.

The IPAM activities use the REST web service activity template to manage IP addresses using an Infoblox DDI Grid Server. These activities are configured to use a MID Server with REST capabilities.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Infoblox DDI IPAM.

### Input variables

**Table 819: IPAM Register IP Address input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>InfobloxServer</td>
<td>Name of the Infoblox DDI Grid Server.</td>
</tr>
<tr>
<td>macAddress</td>
<td>Mac address of the computer for which this IP address is registered.</td>
</tr>
<tr>
<td>ipAddress</td>
<td>Specific IP address to register.</td>
</tr>
<tr>
<td>network</td>
<td>Address of the network containing the registered IP address.</td>
</tr>
<tr>
<td>restCredentials</td>
<td>The sys_id of the REST credentials from the ServiceNow instance.</td>
</tr>
<tr>
<td>api_version</td>
<td>Defines the version of WAPI to use for the integration endpoints. The default value is 2.0.</td>
</tr>
<tr>
<td><strong>Note</strong>:</td>
<td>This field is mandatory. If the field is empty, the orchestration activity will fail.</td>
</tr>
<tr>
<td>view</td>
<td>Name of the Infoblox network view. The default value is default.</td>
</tr>
<tr>
<td><strong>Note</strong>:</td>
<td>If the field is empty, the operation is treated as happening in the default view.</td>
</tr>
</tbody>
</table>

### Output variables

**Table 820: IPAM Register IP Address output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>error</td>
<td>Displays the message for any REST error encountered.</td>
</tr>
</tbody>
</table>
**Variable** | **Description**
--- | ---
IPAAddressRecord | IPAM record of the registered IP address.

### Conditions

**Table 821: IPAM Register IP Address conditions**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully registered the specified IP address.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to register the specified IP address.</td>
</tr>
</tbody>
</table>

**IPAM Reserve IP Address activity**

The IPAM Reserve IP Address activity reserves an IP address in a network using Infoblox IPAM. The output of this activity produces an InfoBlox IP address record that can be used for other IPAM functions in the format fixedaddress/<encrypted key>:<reserved ip address>/<view>.

The IPAM activities use the *(REST web service activity template)* to manage IP addresses using an Infoblox DDI Grid Server. These activities are configured to use a MID Server with REST capabilities.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Infoblox DDI IPAM.

### Input variables

**Table 822: IPAM Reserve IP Address input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>InfobloxServer</td>
<td>Name of the Infoblox DDI Grid Server.</td>
</tr>
<tr>
<td>macAddress</td>
<td>Mac address of the computer for which this IP address is reserved.</td>
</tr>
<tr>
<td>network</td>
<td>Address of the network containing the reserved IP address. The Infoblox server reserves the next available IP address from this network.</td>
</tr>
<tr>
<td>restCredentials</td>
<td>The sys_id of the REST credentials from the ServiceNow instance.</td>
</tr>
<tr>
<td>api_version</td>
<td>Defines the version of WAPI to use for the integration endpoints. The default value is 2.0.</td>
</tr>
</tbody>
</table>

**Note:** This field is mandatory. If the field is empty, the orchestration activity will fail.
Variable | Description
---|---
view | Name of the Infoblox network view. The default value is default.

**Note:** If the field is empty, the operation is treated as happening in the default view.

### Output variables

**Table 823: IPAM Reserve IP Address output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>error</td>
<td>Displays the message for any REST error encountered.</td>
</tr>
<tr>
<td>IPAddressRecord</td>
<td>IPAM record of the reserved IP address.</td>
</tr>
<tr>
<td>IPAddress</td>
<td>Selected IP address to reserve.</td>
</tr>
</tbody>
</table>

### Conditions

**Table 824: IPAM Reserve IP Address conditions**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully reserved the specified IP address.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to reserve the specified IP address.</td>
</tr>
</tbody>
</table>

**IPAM List IP Reservations activity**

The IPAM List IP Reservations activity returns an array of all IP Address within the named InfoBlox Server.

The IPAM activities use the REST web service activity template to manage IP addresses using an Infoblox DDI Grid Server. These activities are configured to use a MID Server with REST capabilities.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Infoblox DDI IPAM .

### Input variables

**Table 825: IPAM List IP Reservations input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>InfobloxServer</td>
<td>Name of the Infoblox DDI Grid Server.</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>restCredentials</td>
<td>The sys_id of the REST credentials from the ServiceNow instance.</td>
</tr>
</tbody>
</table>
| api_version  | Defines the version of WAPI to use for the integration endpoints. The default value is 2.0.  
  **Note:** This field is mandatory. If field is empty, the orchestration activity will fail. |
| view         | Name of the Infoblox network view. The default value is default.             ।  
  **Note:** If the field is empty, the operation is treated as happening with no view and returns the values with data from all views. |

**Output variables**

The output of this activity produces an array of reserved IP addresses in the format fixedaddress/<encrypted key>:<reserved ip address>/<view>.

**Table 826: IPAM List IP Reservations output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>reference</td>
<td>Reference value of a reserved IP address contained in an array of addresses, such as fixedaddress/ZG5zLmZpeGVkX2FkZHJlc3MkMTAuMC4xMTUuMTEuMC4u:0.0.0.11/ default” ipv4addr: “0.0.0.11”</td>
</tr>
<tr>
<td>ipv4addr</td>
<td>The reserved IPv4 address.</td>
</tr>
<tr>
<td>network_view</td>
<td>Routing domain associated with the network returned.</td>
</tr>
<tr>
<td>error</td>
<td>Displays the message for any REST error encountered.</td>
</tr>
</tbody>
</table>

**Conditions**

**Table 827: IPAM List IP Reservations conditions**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully retrieved the list of reserved IP addresses from the Infoblox server.</td>
</tr>
</tbody>
</table>
**IPAM Delete activity**

The IPAM Delete activity deletes an IP Address within a named InfoBlox server.

The IPAM activities use the *REST web service activity template* to manage IP addresses using an InfoBlox DDI Grid Server. These activities are configured to use a MID Server with REST capabilities.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Infoblox DDI IPAM.

### Input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>InfobloxServer</td>
<td>Name of the Infoblox DDI Grid Server.</td>
</tr>
<tr>
<td>itemToDelete</td>
<td>The IP address to delete, in the format fixedaddress/&lt;encrypted key&gt;:&lt;reserved ip address&gt;/&lt;view&gt;.</td>
</tr>
<tr>
<td>restCredentials</td>
<td>The sys_id of the REST credentials from the ServiceNow instance.</td>
</tr>
<tr>
<td>api_version</td>
<td>Defines the version of WAPI to use for the integration endpoints. The default value is 2.0.</td>
</tr>
</tbody>
</table>

**Note:** This field is mandatory. If the field is empty, the orchestration activity will fail.

### Output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DeletedRecord</td>
<td>IPAM record of the deleted IP address.</td>
</tr>
<tr>
<td>error</td>
<td>Displays the message for any REST error encountered.</td>
</tr>
</tbody>
</table>
### Conditions

Table 830: IPAM Delete conditions

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully deleted the specified IP address.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to delete the specified IP address.</td>
</tr>
</tbody>
</table>

### Infobloxx network activities

The Infobloxx network activities manage networks using an Infobloxx DDI Grid Server.

Use these activities to create, list, or delete networks on an Infobloxx server.

*Create Network activity*

The Create Network activity creates new networks on a specified Infobloxx server.

The network activities use the *REST web service activity template* to manage network addresses using an Infobloxx DDI Grid Server. These activities are configured to use a MID Server with REST capabilities.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Infobloxx DDI Network.

### Input variables

Table 831: Create Network input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>InfobloxServer</td>
<td>Name of the Infobloxx DDI Grid Server.</td>
</tr>
<tr>
<td>network</td>
<td>Address of the network to create.</td>
</tr>
<tr>
<td>restCredentials</td>
<td>The sys_id of the REST credentials from the ServiceNow instance.</td>
</tr>
<tr>
<td>api_version</td>
<td>Defines the version of WAPI to use for the integration endpoints. The default value is 2.0.</td>
</tr>
</tbody>
</table>

**Note:** This field is mandatory. If the field is empty, the orchestration activity will fail.

| view          | Name of the Infobloxx network view. The default value is default. |

**Note:** If the field is empty, the operation is treated as happening in the default view.
Output variables

Table 832: Create Network output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NetworkCreated</td>
<td>Address of the network created.</td>
</tr>
<tr>
<td>error</td>
<td>Displays the message for any REST error encountered.</td>
</tr>
</tbody>
</table>

Conditions

Table 833: Create Network conditions

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully created the network.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to create the network.</td>
</tr>
</tbody>
</table>

Get Network Details activity

The Get Network Details activity retrieves the information about a specific network on an Infoblox server. The network activities use the REST web service activity template to manage network addresses using an Infoblox DDI Grid Server. These activities are configured to use a MID Server with REST capabilities. To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Infoblox DDI Network.

Input variables

Table 834: Get Network Details input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>InfobloxServer</td>
<td>Name of the Infoblox DDI Grid Server.</td>
</tr>
<tr>
<td>network</td>
<td>Address of the network whose details you want to see.</td>
</tr>
<tr>
<td>restCredentials</td>
<td>The sys_id of the REST credentials from the ServiceNow instance.</td>
</tr>
<tr>
<td>api_version</td>
<td>Defines the version of WAPI to use for the integration endpoints. The default value is 2.0.</td>
</tr>
</tbody>
</table>

Note: This field is mandatory. If the field is empty, the orchestration activity will fail.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>view</td>
<td>Name of the Infoblox network view. The default value is default.</td>
</tr>
<tr>
<td>Note: If the field is empty, the operation is treated as happening in the default view.</td>
<td></td>
</tr>
</tbody>
</table>

**Output variables**

The output variables from this activity are objects on the Infoblox server used to identify network details. For more information, refer to the Infoblox documentation.

Table 835: Get Network Details output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>error</td>
<td>Displays the message for any REST error encountered.</td>
</tr>
<tr>
<td>NetworkOptions</td>
<td>The NetworkOptions array contains these attributes:</td>
</tr>
<tr>
<td></td>
<td>• reference: Reference value for the network requested. This value is in the form of network/ ZG5zLm5idHdvcmskMTAuMS4wLjAvMTYvMA:10.1.0.0%2F1</td>
</tr>
<tr>
<td></td>
<td>• options: The options array contains these attributes:</td>
</tr>
<tr>
<td></td>
<td>• name: Name of the network option returned, such as domain-name-server.</td>
</tr>
<tr>
<td></td>
<td>• num: Index number of the option. For example, the index for domain-name-server is 6.</td>
</tr>
<tr>
<td></td>
<td>• use_option: Indicates whether a DHCP option is used at that level in the network hierarchy. Set this value to True to override the Grid Level DHCP option with this option at the network level.</td>
</tr>
<tr>
<td></td>
<td>• value: Value to use for this option. For example, the value for the domain-name-server option is the IP address of the server machine.</td>
</tr>
<tr>
<td></td>
<td>• vendor_class: The class of the network object. The options are DHCP, DNS, or IPAM.</td>
</tr>
</tbody>
</table>
**Conditions**

**Table 836: Get Network Details conditions**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully retrieved network details from the Infoblox server.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to retrieve network details from the Infoblox server.</td>
</tr>
</tbody>
</table>

*Delete Network activity*

The Delete Network activity deletes a network from an Infoblox server.

The network activities use the [REST web service activity template](#) to manage network addresses using an Infoblox DDI Grid Server. These activities are configured to use a MID Server with REST capabilities.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Infoblox DDI Network.

**Input variables**

**Table 837: Delete Network input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>InfobloxServer</td>
<td>Name of the Infoblox DDI Grid Server.</td>
</tr>
<tr>
<td>networkToDelete</td>
<td>Reference number of the network to delete from the Infoblox server. You can obtain this value either by using the List Registered Networks activity or when creating a network with the Create Network activity. An example of the network reference value is: network/ZG5zLm5ldHdvcmstkMTUuMC40NS4wLzI0LzA:15.0.45.0/24/default.</td>
</tr>
<tr>
<td>restCredentials</td>
<td>The sys_id of the REST credentials from the ServiceNow instance.</td>
</tr>
<tr>
<td>api_version</td>
<td>Defines the version of WAPI to use for the integration endpoints. The default value is 2.0.</td>
</tr>
</tbody>
</table>

**Note:** This field is mandatory. If the field is empty, the orchestration activity will fail.
Output variables

Table 838: Delete Network output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DeletedNetwork</td>
<td>Reference number of the deleted network from the Infoblox server.</td>
</tr>
<tr>
<td>error</td>
<td>Displays the message for any REST error encountered.</td>
</tr>
</tbody>
</table>

Conditions

Table 839: Delete Network conditions

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully deleted the network.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to delete the network.</td>
</tr>
</tbody>
</table>

List Registered Networks activity

The List Registered Networks activity retrieves all the networks associated with an Infoblox server.

The network activities use the REST web service activity template to manage network addresses using an Infoblox DDI Grid Server. These activities are configured to use a MID Server with REST capabilities.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Infoblox DDI Network.

Input variables

Table 840: Activity input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>InfobloxServer</td>
<td>Name of the Infoblox DDI Grid Server.</td>
</tr>
<tr>
<td>restCredentials</td>
<td>The sys_id of the REST credentials from the ServiceNow instance.</td>
</tr>
<tr>
<td>api_version</td>
<td>Defines the version of WAPI to use for the integration endpoints. The default value is 2.0.</td>
</tr>
</tbody>
</table>

**Note:** This field is mandatory. If field is empty, the orchestration activity will fail.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>view</td>
<td>Name of the Infoblox network view. The default value is default.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> If the field is empty, the operation is treated as happening with no view and returns the values with data from all views.</td>
</tr>
</tbody>
</table>

**Output variables**

**Table 841: Activity output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>reference</td>
<td>Reference value of a registered network.</td>
</tr>
<tr>
<td>network</td>
<td>Network address.</td>
</tr>
<tr>
<td>network_view</td>
<td>Routing domain associated with the network returned.</td>
</tr>
<tr>
<td>error</td>
<td>Displays the message for any REST error encountered.</td>
</tr>
</tbody>
</table>

**Conditions**

**Table 842: Activity conditions**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully retrieved the list of registered networks available on the Infoblox server.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to retrieve the list of registered networks available on the Infoblox server.</td>
</tr>
</tbody>
</table>

**PowerShell activity pack**

PowerShell is built on the Windows .NET Framework and is designed to control and automate the administration of Windows machines and applications.

Orchestration provides custom PowerShell activities that were created with the PowerShell activity designer template. These activities perform the same functions as PowerShell activities by the same name from previous releases and replace those activities for all new workflows. These custom activities give workflow administrators the ability to store input and output variables in the **databus**.
Note: Existing workflows from earlier versions that were created with legacy PowerShell activities continue to function normally after an upgrade to Geneva. However, all new workflows must use these custom PowerShell activities.

Starting with the London release, there are the following updates to the PowerShell activity pack:

- A new PowerShell probe (V2), which takes advantage of IntegrationHub functionality
- The ability to insert debug statements in the PowerShell scripts and produce the resulting messages at runtime

To use the PowerShell custom activities, you must request activation of the Orchestration - PowerShell plugin. These activities are available in the Workflow Editor on the Custom tab. Expand the Custom Activities tree and select the PowerShell category for the activity you want to use.

ServiceNow supports PowerShell 2.0 and above. PowerShell 3.0 does not support Windows 2003 Server.

PowerShell activity designer

PowerShell activities are configured to return data to a workflow from a host using Microsoft PowerShell.

You must purchase Orchestration on page 1741 to use this template. For specific information about using the tools in the activity designer, refer to these resources:

- Orchestration activity designer on page 1990
- Create input variables on page 2000
- Create a parsing rule

ServiceNow supports PowerShell 2.0 and above. PowerShell 3.0 does not support Windows 2003 Server.

PowerShell protocols and troubleshooting

PowerShell uses the Windows Management Instrumentation (WMI) and Windows Remote Management (WinRM) protocols to enable Orchestration activities to run commands on remote Windows hosts.

Windows Management Instrumentation (WMI)

WMI provides a uniform interface for any local or remote applications or scripts that obtain management data from a computer system, a network, or an enterprise. WMI contains these components:

- Managed objects and WMI providers: A WMI provider is a COM object that monitors one or more managed objects for WMI. A managed object is a logical or physical enterprise component, such as a hard disk drive, network adapter, database system, operating system, process, or service.
- WMI infrastructure: The WMI infrastructure is a Microsoft Windows operating system component known as the WMI service (winmgmt). The WMI infrastructure is composed of the WMI Core and the WMI repository. The WMI repository is organized by WMI namespaces. The WMI service creates namespaces, such as root\default, root\cimv2, and root\subscription, at system startup and preinstalls a default set of class definitions, including the Win32 Classes, the WMI System Classes, and others. The remaining namespaces found on your system are created by providers for other parts of the operating system or products.
- WMI consumers: A WMI consumer is a management application or script that interacts with the WMI infrastructure. A management application can query, enumerate data, run provider methods, or subscribe to events by calling either the COM API or the Scripting API for WMI.

WMI installation and configuration
For the MID Server to successfully make a remote connection to the target host, TCP port 135 must be open. The Windows firewall automatically creates an inbound rule for WMI connectivity called Windows Management Instrumentation (DCOM-In).

**Windows Remote Management (WinRM)**

WinRM is the Microsoft implementation of WS-Management Protocol, a standard Simple Object Access Protocol (SOAP) protocol that allows hardware and operating systems from different vendors to interoperate.

WinRM contains these components:

- **WinRM Scripting API**: This scripting API enables Orchestration to obtain data from remote computers, using scripts that perform WS-Management protocol operations.
- **WMI Service**: The WMI service continues to run side-by-side with WinRM and provides requested data or control through the WMI plug-in. You can continue to obtain data from standard WMI classes, such as Win32_Process.

WinRM configuration

WinRM is automatically installed on Windows 2008 R2 and above operating systems, but must be configured before use.

1. In a command prompt, enter `winrm quickconfig`. This command is not case sensitive.
2. When the console displays `Make these changes [y/n]?`, enter `y`.

   The `winrm quickconfig` command performs the following operations:
   - Starts the WinRM service, and sets the service startup type to auto start.
   - Configures a listener for the ports that send and receive WS-Management protocol, using either HTTP or HTTPS on any IP address.
   - Creates a firewall exception for the current user profile.

*MID Server PowerShell files*

PowerShell functions are stored in script files (*.ps1) that use a PowerShell Script module (*.psm1) file name extension.

The PowerShell functions are used by the PowerShell MID Server script files included in these activity packs:

- Active Directory
- Exchange
- SCCM
- PowerShell

**PSScript.ps1**

This script performs a few tasks, such as credential testing, password encryption, and the execution of scripts configured in the Orchestration Activity Designer or in MID Script Files. However, this document focuses on how PSScript.ps1 uses the credential.psm1 module for testing access to remote hosts.

The PowerShell variables are generally used directly in the *PowerShell execution command* or as arguments in the MID Server script file you specify. There are special variables that are passed to PSScript.ps1, such as `credType`. 
Figure 377: Using credType in execution parameters

This record is in the System Center Configuration Manager (SCCM) application, but Global is the current application. To edit this record click here.
**PowerShell credTypes**

The PowerShell credential types:

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WMI</td>
<td>testCredentialWMI</td>
</tr>
<tr>
<td>Exchange</td>
<td>testCredentialExchange</td>
</tr>
<tr>
<td>AD</td>
<td>testCredentialAD</td>
</tr>
<tr>
<td>SCCM</td>
<td>testCredentialSCCM</td>
</tr>
</tbody>
</table>

If no credential type is passed to the PSScrip.ps1 script, the MID Server defaults to the WMI test function to test access to the target host. If there is a credential type used, the MID Server runs the corresponding test function for that credential type.

**Exit codes**

These exit codes are returned from the PSScript.ps1 script and logged in the MID Server log file.

<table>
<thead>
<tr>
<th>Type</th>
<th>Test function</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>PowerShell command/script ran successfully.</td>
</tr>
<tr>
<td>1</td>
<td>Test finished successfully, but the command/script failed to execute.</td>
</tr>
<tr>
<td>2</td>
<td>Incorrect syntax passed to script.</td>
</tr>
<tr>
<td>3</td>
<td>All credentials including MID Server service account failed to execute command/script.</td>
</tr>
<tr>
<td>4</td>
<td>Passed test and executed the activity, but an error was returned. Example user cannot be found.</td>
</tr>
</tbody>
</table>

**DiagnosticsUtil.psm1**

The MID Server uses this module file to perform PowerShell logging that assists debugging any Orchestration activity using PowerShell scripting. You can also add debugging statements directly to custom scripts.
Table 844: PowerShell diagnostic utilities

<table>
<thead>
<tr>
<th>Utility</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNCLog-DebugInfo</td>
<td>Log a debug message for a PowerShell script or PowerShell Orchestration activity. Examples:</td>
</tr>
<tr>
<td></td>
<td>• SNCLog-DebugInfo -message &quot;My debug message...&quot;</td>
</tr>
<tr>
<td></td>
<td>• SNCLog-DebugInfo &quot;My debug message&quot;</td>
</tr>
<tr>
<td>SNCLog-ParameterInfo</td>
<td>Log a function parameter value. For &quot;function getHostName{ param( [String] $target )&quot; , the first value to the PowerShell hashtable is a string to indicate which function executes, and the values for each of the function parameters. Examples:</td>
</tr>
<tr>
<td></td>
<td>• Function with single parameter: SNCLog-ParameterInfo @(&quot;Running getHostName&quot;, $target)</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> The debug message shows, 'Running getHostName $target: [actual value of $target]'</td>
</tr>
<tr>
<td></td>
<td>• Function with multiple parameters: SNCLog-ParameterInfo @(&quot;Running functionName&quot;, $param1, $param2, $param3)</td>
</tr>
<tr>
<td>SNCObfuscate-Value</td>
<td>Use this utility to encrypt values for security purposes. The function displays &quot;$variableName&quot;:*** , where *** is the obfuscated value. Example:</td>
</tr>
<tr>
<td></td>
<td>• SNCObfuscate-Value $password</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> The debug message reads: &quot;$password : ***&quot;</td>
</tr>
</tbody>
</table>

Credentials.psm1

The MID Server uses this module file to test access to a target host. The MID Server loops through all Windows credentials stored in its credentials table using the following access type functions, unless the PowerShell activity has a credential type (credType) defined. All ServiceNow® authored PowerShell activities are hard-coded to use a specific credential type. As a result, the MID Server only tests credential access against the designated function.

Table 845: PowerShell test functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>testCredentialWMI</td>
<td>Tests the given user and password on the target host using the Get-WMI object.</td>
</tr>
<tr>
<td>Function</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>testCredentialAD</td>
<td>Tests the given user and password on the target host using the built-in DirectoryEntry object.</td>
</tr>
<tr>
<td>testCredentialExchange</td>
<td>Tests the given user and password to create a session on an Exchange host. This test uses the built-in PowerShell remoting feature on a remote host. WinRM is configured on Exchange servers by default.</td>
</tr>
<tr>
<td>testCredentialSCCM</td>
<td>Tests the given user and password to create a session on an SCCM server. This test uses the built-in PowerShell remoting feature on a remote host. This test requires WinRM to be configured.</td>
</tr>
<tr>
<td>testNoCredentialAccessWMI</td>
<td>Tests the given user and password on the target host, using the Get-WMI object. This test is used when no credType is used.</td>
</tr>
</tbody>
</table>

**Note:** If the test passes using one of these functions, that credential is used to run the PowerShell script/command. If the tests fail to access the target host using these functions, the MID Server runs the PowerShell script/command under the account of the MID Server service.

This diagram illustrates the dependency of the credential selection behavior on the host being targeted by the PowerShell activity. If the target host is the IP address or host name of the MID Server, the MID Server bypasses all credentials in the Credentials table and uses the account of the MID Server service. If the target host is not the MID Server, then all Windows credentials are used first. If all credentials in the Credentials table are unsuccessful in running the PowerShell activity, then the MID Server uses the MID Server service account.
Figure 378: PowerShell credential selection criteria
ActiveDirectory.psm1

This module file stores the functions used by the PowerShell scripts shipped with the *Active Directory* activity pack.

Exchange.psm1

This module file stores the functions used by the PowerShell scripts shipped with the *Exchange* activity pack.

SCCM.psm1

This module file stores the functions used by the PowerShell scripts shipped with the *SCCM* activity pack.

Set up credential tags for a PowerShell activity

Credential tagging gives an administrator more control over the credentials used in a PowerShell activity.

Role required: admin, activity_creator or workflow_admin

Tagging is useful when the activity requires specific credentials to perform a task. By populating the Credential tag field you are telling the activity to use a credential that has a specific tag set for it. Additionally, credential tagging allows you to use a different underlying credential in development, testing, and production systems without having to change the activity for a given target system. For example, you can use the SCCMCred tag and have it point to both a development and test instance.

1. Navigate to Orchestration Credentials .
2. Select the credential you want to tag.
3. Enter a unique name in the Tag field that is descriptive of the credentials purpose.
4. Click Update.
5. Open the Workflow Editor and select the PowerShell activity you want to tag.
6. In the activity's Execution Command, add the name of the tag you created to the Credential tag field.
Figure 380: Adding a credential tag to an activity

You are editing a record in the Active Directory application (cancel)

Welcome Disable AD User Account

Activity Designer - Disable AD User Account

You are editing a record in the Active Directory application (cancel)

General Inputs Pre Processing Execution Command Outputs Post Processing Conditions

{ } Input

ABC DomainController

ABC User

Drag variable from the left to template fields below to create associations to the template inputs below.

Target host: $(activityInput,DomainController)

Script type: MID Server script file

MID Server script file: UpdateADObject.ps1

PowerShell variables:

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>objectName</td>
<td>$(activityInput,User)</td>
<td>Plain</td>
</tr>
<tr>
<td>type</td>
<td>user</td>
<td>Plain</td>
</tr>
<tr>
<td>credType</td>
<td>AD</td>
<td>Plain</td>
</tr>
</tbody>
</table>

Credential tag: AD User Admin

Required MID Server capabilities: PowerShell

Continue
**PowerShell troubleshooting**

Authentication and access denied errors can prevent PowerShell activities from running a command on a target host.

Use these procedures for troubleshooting authentication failures with Orchestration PowerShell activities and when the Remote Procedure Call (RPC) server is unavailable or when access is denied. The authentication failure error displays when all credentials, including those of the local MID Server service account, do not have the correct permissions to run the Powershell script/command. The same error displays when the target host is unreachable.

**Figure 381: Authentication error message**

Authentication failure in an Active Directory activity

This example uses the Create AD Object activity to illustrate troubleshooting authentication failure in PowerShell.

Role required: Permissions to access and create accounts on Active Directory

Validate that the account you are using has the proper permissions to run the activity.

1. Log on to the target machine using the account under which you want to run the activity.
   
   Active Directory tools must be installed on this machine.

2. Launch the Active Directory Users and Computers application.

3. Navigate to the OU under which you want to create the Active Directory object.

4. Attempt to create the object.

   If this procedure is successful under the specified user, the following might be the cause of the authentication failure:

   • User name is invalid.
   • Password entered incorrectly.
   • Domain controller is unreachable.

**Note:** The majority of the return codes listed in the MID Server log for this error are 1s and 3s. This is because the Active Directory activities use the ADSI provider and not WMI or WinRM. An error code of 1 means the account was able to connect with the test account, but running the script failed.
An error code of 3 means that the MID Server attempted to run the PowerShell activity under the MID Server service account but failed.

```
Attempting to use credential with username service-now\joe1.zamallo
Running command: -> C:\windows\System32\windowspowershell\v1.0\powershell\PSScript.ps1' --computer '10.11.144.230' --script 'C:\Users\j
useCred $true -isDiscovery $false -debug $true; exit $LASTEXITCODE'}
Thread name is Powershell is executing...
The exit value from waitFor() is 1
The status code returned from running the command is 1
```

Authentication failure in an Exchange activity

This example uses the Create Mailbox activity to illustrate troubleshooting authentication failure in PowerShell.

Role required: Permissions to access and create mailboxes on the Exchange server

1. Validate that the account you are using has the proper permissions to run the PowerShell activity.
2. Log on to a machine that has the Exchange Management Shell (EMS) installed.
3. Create a user using the New-mailbox Exchange commandlet.
If this procedure is successful under the specified credential, the following is the likely cause of the failure:

- User name is invalid.
- Password entered incorrectly.
- Exchange server is unreachable.

4. If the Exchange server is unreachable, examine the MID Server logs. Because the Exchange activities use WinRM to access the Exchange server, the logs can provide more troubleshooting information.

![Remote Procedure Call (RPC) server unavailable or access denied](image)

**Remote Procedure Call (RPC) server unavailable or access denied**

Typically, this error is logged when running a PowerShell script/command that uses WinRM or WMI.

**Possible causes of error**

The target host might have one of these issues:

- WinRM isn’t configured.
- Firewall is blocking access to the host over TCP port 135 (WMI) or HTTP/HTTPs and TCP port 5985 (WinRM).
- Kerberos issue, caused by hopping to multiple hosts using WMI.
Example WinRM error

The Create Mailbox activity from the Exchange activity pack has generated an error in the ECC queue involving authentication using the MID Server service credential. This occurred because the MID Server credential is the last to be used if the targeted host is not the MID Server.

Figure 383: Authentication failure error message

The MID Server log shows that the MID Server tried to run the activity under specific credentials, but wasn’t successful and received an exit code of 1.

Figure 384: MID Server error code
Join Domain activity

The Join Domain activity joins a Windows computer to a domain.

If the computer is already a member of a domain, this activity completes without modifying the computer. Joining a domain requires a username and password. This user must have domain administration privileges or privileges to join a computer to the domain.

**Note:** This activity replaces a Powershell activity by the same name available in releases prior to Geneva. If you have a workflow created in a previous version that uses the deprecated activity, your workflow will continue to work normally after upgrading to Geneva. However, all new workflows must use the custom version of this activity. This activity was built with the **PowerShell activity designer** on page 1923, which gives workflow administrators the ability to store input and output variables in the **databus**.

**Input variables**

**Table 846: Join Domain input variables**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hostname</td>
<td>Hostname or IP address of the Windows server that is joining the domain.</td>
</tr>
<tr>
<td>Domain</td>
<td>Name of the domain to join.</td>
</tr>
<tr>
<td>Domain_user</td>
<td>The name of a user who has domain administration privileges or privileges to join a computer to the domain.</td>
</tr>
<tr>
<td>Domain_user_password</td>
<td>The password for the user who has domain administration privileges or privileges to join a computer to the domain.</td>
</tr>
</tbody>
</table>

**Output variables**

**Table 847: Join Domain output variables**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>errorMessage</td>
<td>The executionResult.errorMessages from the <strong>Activity designer parsing sources</strong> on page 1918. If this variable is not null, the operation has failed.</td>
</tr>
</tbody>
</table>
Conditions

Table 848: Join Domain conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The activity succeeded in joining the computer to the domain.</td>
</tr>
<tr>
<td>Failure</td>
<td>The activity failed to join the computer to the domain.</td>
</tr>
</tbody>
</table>

Install Windows App activity

The Install Windows App activity installs an application from an MSI package on a Windows target machine.

**Note:** This activity replaces a Powershell activity by the same name available in releases prior to Geneva. If you have a workflow created in a previous version that uses the deprecated activity, your workflow will continue to work normally after upgrading to Geneva. However, all new workflows must use the custom version of this activity. This activity was built with the *PowerShell activity designer* on page 1923, which gives workflow administrators the ability to store input and output variables in the *databus*.

Input variables

Table 849: Install Windows App input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>hostname</td>
<td>Hostname or IP address of the target Windows machine on which the service is installed. Use the Resolve DNS <em>MID Server capability</em> to resolve hostnames into IP addresses.</td>
</tr>
<tr>
<td>installerpath</td>
<td>Path to the installer. The installer can be on any machine that is visible to both the MID Server and the target machine (local drive, UNC path, mapped drive, etc.).</td>
</tr>
<tr>
<td>installer</td>
<td>Name of the installer file, such as winzip150.msi. The installer must be an MSI package.</td>
</tr>
<tr>
<td>arguments</td>
<td>The parameter that contains the command line arguments to the MSI package. These are name=value pairs, separated by a space. For example, the argument might appear as: INSTALLDIR=c:\myinstallfolder ADDDESKTOPICON=0. These arguments are dependent on what the actual MSI being installed defines. If there are no arguments, leave the field empty.</td>
</tr>
</tbody>
</table>
Output variables

Table 850: Install Windows App output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>errorMessage</td>
<td>The executionResult.errorMessages from the Activity designer parsing sources</td>
</tr>
</tbody>
</table>

Conditions

The activity state tells the workflow engine what to do with the activity.

Table 851: Install Windows App conditions

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The Windows application was successfully installed on the target machine.</td>
</tr>
<tr>
<td>Failure</td>
<td>The Windows application failed to install on the target machine</td>
</tr>
</tbody>
</table>

Enable WMI Windows Installer provider

To install software on Windows machines using the Install Windows App activity, enable WMI Windows Installer provider on all target machines.

- It is recommended that the MID Server, the target machine, and the installer source machine be on the same Active Directory domain. However, if these computers are on separate domains, those domains must have a trust relationship established between them.
- If the installer path is a UNC file sharing machine, the Active Directory account of the target computer must be trusted for delegation. For instructions on this configuration, see the posting on the community for installing and uninstalling Windows applications.

Note: See WMI Providers for a list of Windows operating systems that provide this tool by default.

1. Open the Control Panel.
2. Go to Add or Remove Programs.
3. Select Add/Remove Windows Components.
   This action opens a secondary window displaying additional selections.
5. Select WMI Windows Installer Provider check box.
6. Click OK to return to the Windows Components Wizard window.
7. Click Next.
   You might be asked for the Windows installation CD to complete this process.
Change Service State activity

The Change Service State activity starts or stops a Windows service on a remote system.

This activity replaces a Powershell activity by the same name available in releases prior to Istanbul. If you have a workflow created in a previous version that uses the deprecated activity, your workflow will continue to work normally after upgrading to Istanbul. However, all new workflows must use the custom version of this activity. This activity was built with the Powershell activity template, which gives workflow administrators the ability to store input and output variables in the databus.

Input Variables

Table 852: Change Service State input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>hostname</td>
<td>Hostname or IP address of the target Windows machine on which the service is installed. Use the Resolve DNS activity to resolve hostnames into IP addresses.</td>
</tr>
<tr>
<td>service</td>
<td>Name of the Windows service to start or stop. The service parameter is the service name, not the display name of the service affected.</td>
</tr>
<tr>
<td>state</td>
<td>There are two actions to select for a service state change: StartService or StopService.</td>
</tr>
</tbody>
</table>

Output variables

Table 853: Change Service State output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>errorMessage</td>
<td>The executionResult.errorMessages from the Activity designer parsing sources on page 2018. If there is no error, this value is null.</td>
</tr>
</tbody>
</table>

Conditions

Table 854: Change Service State conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The target service was successfully started or stopped.</td>
</tr>
<tr>
<td>Failure</td>
<td>The update to the target service was unsuccessful, or the service was not found on the target system.</td>
</tr>
</tbody>
</table>
Restart Windows Server activity

The Restart Windows Server activity stops and then restarts a Windows server using PowerShell.

**Note:** This activity replaces a PowerShell activity by the same name available in releases prior to Geneva. If you have a workflow created in a previous version that uses the deprecated activity, your workflow will continue to work normally after upgrading to Geneva. However, all new workflows must use the custom version of this activity. This activity was built with the PowerShell activity template, which gives workflow administrators the ability to store input and output variables in the databus.

**Input variables**

**Table 855: Restart Windows Server input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hostname</td>
<td>Hostname or IP address of the Windows server to restart.</td>
</tr>
</tbody>
</table>

**Output variables**

**Table 856: Restart Windows Server output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>errorMessage</td>
<td>The executionResult.errorMessages from the Activity designer parsing sources on page 2018. If this variable is not null, the operation has failed.</td>
</tr>
</tbody>
</table>

**Conditions**

**Table 857: Restart Windows Server conditions**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The activity succeeded in restarting the Windows server.</td>
</tr>
<tr>
<td>Failure</td>
<td>The activity failed to restart the Windows server.</td>
</tr>
</tbody>
</table>

Uninstall Windows App activity

The Uninstall Windows App activity uninstalls an application from a Windows target machine.
The only applications that can be uninstalled using this activity are those that were installed by a Windows Installer.

**Note:** This activity replaces a Powershell activity by the same name available in releases prior to Geneva. If you have a workflow created in a previous version that uses the deprecated activity, your workflow will continue to work normally after upgrading to Geneva. However, all new workflows must use the custom version of this activity. This activity was built with the **Powershell activity template**, which gives workflow administrators the ability to store input and output variables in the ***databus***.

### Input variables

**Table 858: Uninstall Windows App input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>hostname</td>
<td>Hostname or IP address of the Windows target machine on which to uninstall an application.</td>
</tr>
<tr>
<td>product</td>
<td>The name of the application to uninstall exactly as it appears in the Windows Add/Remove Programs list.</td>
</tr>
</tbody>
</table>

### Output variables

**Table 859: Uninstall Windows App output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>errorMessage</td>
<td>The executionResult.errorMessages from the <strong>Activity designer parsing sources</strong> on page 2018. If this variable is not null, the operation has failed.</td>
</tr>
</tbody>
</table>

### Conditions

**Table 860: Uninstall Windows App conditions**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The activity succeeded in uninstalling the application from the Windows server.</td>
</tr>
<tr>
<td>Failure</td>
<td>The activity failed to uninstall the application from the Windows server.</td>
</tr>
</tbody>
</table>
Probe activity pack

Orchestration provides an activity pack customized using the ServiceNow activity designer that runs probes on target hosts to return specific information.

These custom activities were built with the Create a probe activity on page 2083, which gives workflow administrators the ability to store input and output variables in the databus.

To use the custom probe activities, you must request activation of the Orchestration - Probe plugin.

Resolve DNS Name activity

The Resolve DNS Name activity takes an IP address or a fully qualified domain name (FQDN), which it resolves into one or more IP addresses.

The domain name is sent through the MID Server to the domain name system (DNS) to resolve the name. If a single IP address is returned, it is stored in two variables: resolved_ip and resolved_ips. If multiple IP addresses are returned, the first IP address is stored in the resolved_ip variable, and all the addresses are stored in the resolved_ips variable. If an IP address is provided instead of an FQDN, this address is output directly to both variables. Your ServiceNow instance must have access to a MID Server configured to use Resolve DNS to run this activity.

This activity replaces an activity by the same name available in releases prior to Istanbul. If you have a workflow created in a previous version that uses the deprecated activity, your workflow will continue to work normally after upgrading to Istanbul. However, all new workflows must use the custom version of this activity. This activity was built with the Probe activity template, which gives workflow administrators the ability to store input and output variables in the databus.

Input variables

**Table 861: Resolve DNS Name input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FQDN</td>
<td>The fully qualified domain name to resolve or an IP address.</td>
</tr>
</tbody>
</table>

Output variables

**Table 862: Resolve DNS Name output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ip</td>
<td>The first IP address of the resolved DNS name.</td>
</tr>
<tr>
<td>ips</td>
<td>Comma separated list of resolved IP addresses.</td>
</tr>
</tbody>
</table>
| result   | One of the following:  
|          | • resolved: Able to resolve the specified DNS name.  
|          | • unresolved: Unable to resolve the specified DNS name. |
Conditions

Table 863: Resolve DNS Name conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully resolved the DNS name.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to resolve the DNS name.</td>
</tr>
</tbody>
</table>

SNMP Query activity

The SNMP Query activity queries an SNMP device.

Your ServiceNow instance must have access to a MID Server configured to use SNMP to run this activity. This activity replaces an activity by the same name available in releases prior to Istanbul. If you have a workflow created in a previous version that uses the deprecated activity, your workflow will continue to work normally after upgrading to Istanbul. However, all new workflows must use the custom version of this activity. This activity was built with the Probe activity template, which gives workflow administrators the ability to store input and output variables in the databus.

Input variables

Table 864: SNMP Query input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>hostname</td>
<td>Hostname or IP address of the SNMP device being queried.</td>
</tr>
<tr>
<td>oids</td>
<td>A list of unique object identifiers used to identify SNMP devices.</td>
</tr>
</tbody>
</table>

Output variables

Table 865: SNMP Query output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>description</td>
<td>Description of the SNMP object.</td>
</tr>
<tr>
<td>timeout</td>
<td>Boolean value indicating whether or not the query timed out.</td>
</tr>
<tr>
<td>error</td>
<td>Indicates any error that occurred. If no error occurred, this value is null.</td>
</tr>
<tr>
<td>oid_data</td>
<td>An array of data objects for all unique object identifiers.</td>
</tr>
</tbody>
</table>
Conditions

Table 866: SNMP Query conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully ran the query on the target device.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to run the query on the target device. Failure could be caused by invalid credentials or a device that is not accessible.</td>
</tr>
</tbody>
</table>

SCCM activity pack

The Microsoft System Center Configuration Management (SCCM) activity pack provides Orchestration activities you can use to manage software deployments and collections on an SCCM server.

You can use SCCM Orchestration activities to deploy and revoke software from an SCCM server or manage user and device collections. The system manages software on an SCCM server using Orchestration activities and workflows.

Client software distribution requires:

- SCCM 2012 R2 and later.
- Powershell 3.0.
- Powershell Remoting enabled.
- The Windows PowerShell x86 execution policy must be set to unrestricted mode.
- Latest version of the SCCM cmdlet library installed on the SCCM server.
- Use the credentials to log onto the SCCM Server and connect via Windows PowerShell from the System Center Configuration Manager console at least once to set the path variable for that credential.

Activate SCCM activities

The Orchestration - System Center Configuration Manager plugin installs the SCCM activity pack that deploys software from an SCCM host and manages user and device collections.

The SCCM plugin is activated automatically when the Orchestration - Client Software Distribution [com.snc.orchestration.sccm_mgmt] plugin is activated, but can be activated separately.

**Note:** The activities in the SCCM plugin run in the System Center Configuration Manager scope.

1. In the HI Service Portal, click Service Requests Activate Plugin.
2. Fill out the form.

<table>
<thead>
<tr>
<th>Target Instance</th>
<th>Instance on which to activate the plugin.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plugin Name</td>
<td>Name of the plugin to activate.</td>
</tr>
</tbody>
</table>
Specify the date and time you would like this plugin to be enabled

<table>
<thead>
<tr>
<th>Date and time must be at least 2 business days from the current time.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Note:</strong> Plugins are activated in two batches each business day in the Pacific time zone, once in the morning and once in the evening. If the plugin must be activated at a specific time, enter the request in the Reason/Comments.</td>
</tr>
</tbody>
</table>

Reason/Comments

| Provide any information that would be helpful for the ServiceNow personnel activating the plugin. For example, if you need the plugin activated at a specific time instead of during one of the default activation windows. |

3. Click Submit.

Configure the MID Server for SCCM activities

To use a MID Server with Microsoft System Center Configuration Management (SCCM) activities, configure it to communicate with the SCCM server.

Role required: admin

1. In the navigation filter, enter cmdb_ci_dns_name.list.
2. Click New.
3. Enter the fully-qualified domain name (FQDN) of the SCCM server in the Name field.
4. Right-click in the form header and select Save.
5. In the IP Address related list, click New.
6. In the IP Address field, enter the IP address of the SCCM server.
7. In the Nic field, select eth0 or your preferred network interface controller.
8. Leave the Netmask field blank.
9. Click Submit.

Add to Device Collection activity

The Add to Device Collection activity adds the specified device into a Microsoft System Center Configuration Manager (SCCM) device collection.

The Add to Device Collection activity uses the *Powershell activity template* to add a specified device to an SCCM device collection. The activity is configured to use a MID Server with Powershell capabilities and to run a MID Server script called AddToDeviceCollection.ps1 to edit the collection.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities System Center Configuration Manager (SCCM).

---

**Note:** The Add to Device Collection activity does not use pre-processing or post processing scripts.
Input variables

Table 867: Add to Device Collection input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sccmServer</td>
<td>The fully qualified domain name (FQDN) of the SCCM server.</td>
</tr>
<tr>
<td>collection</td>
<td>Name of the device collection.</td>
</tr>
<tr>
<td>device</td>
<td>Name of the device to add to the collection.</td>
</tr>
</tbody>
</table>

Output variables

Table 868: Add to Device Collection output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>output</td>
<td>Variable that contains a value that is passed to other activities in the workflow.</td>
</tr>
<tr>
<td>error</td>
<td>Variable that contains the activity output error message.</td>
</tr>
</tbody>
</table>

Conditions

Table 869: Add to Device Collection conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully added the device to the SCCM device collection.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to add the device to the SCCM device collection.</td>
</tr>
</tbody>
</table>

Add to User Collection activity

The Add to User Collection activity adds a user to a Microsoft System Center Configuration Manager (SCCM) user collection.

The Add to User Collection activity uses the PowerShell activity template to access the SCCM server. The activity is configured to use a MID Server with Powershell capabilities and to run a MID Server script called AddToUserCollection.ps1 to edit the collection.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities System Center Configuration Manager (SCCM).

**Note:** The Add to User Collection activity does not use pre-processing or post processing scripts.
### Input variables

**Table 870: Add to User Collection input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sccmServer</td>
<td>The fully qualified domain name (FQDN) of the SCCM server.</td>
</tr>
<tr>
<td>collection</td>
<td>Name of the user collection.</td>
</tr>
<tr>
<td>user</td>
<td>Name of the user to add to the collection.</td>
</tr>
</tbody>
</table>

### Output variable

**Table 871: Add to User Collection output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>output</td>
<td>Variable that contains a value that is passed to other activities in the workflow.</td>
</tr>
<tr>
<td>error</td>
<td>Variable that contains the activity output error message.</td>
</tr>
</tbody>
</table>

### Conditions

**Table 872: Add to User Collection conditions**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully added a user to the SCCM user collection.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to add a user to the SCCM user collection.</td>
</tr>
</tbody>
</table>

### Get Applications activity

The Get Applications activity returns a list of all the applications available on a Microsoft System Center Configuration Manager (SCCM) server.

The Get Applications activity uses the *Powershell activity template* to access the applications on the SCCM server. The activity is configured to use a MID Server with Powershell capabilities and to run a MID Server script called GetApplications.ps1. This script filters the results of the GET, so that only specific attributes are returned for the applications on the SCCM server. Filtering the results in this manner controls the size of the payload, while providing the most desirable application data. The list of available applications is returned as an array in a JSON object.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities System Center Configuration Manager (SCCM).
Note: The Get Applications activity does not use a pre-processing script.

**Input variables**

Table 873: Get Applications input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sccmServer</td>
<td>The fully qualified domain name (FQDN) of the SCCM server.</td>
</tr>
</tbody>
</table>

**Output variables**

The output variables for the Get Applications activity contain an array of objects called applications and an error message. Each object in the array contains the attributes in this table.

Table 874: Get Applications output variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>applications</td>
<td>The applications array contains these attributes:</td>
</tr>
<tr>
<td></td>
<td>• id: Primary key of the SCCM application.</td>
</tr>
<tr>
<td></td>
<td>• ciUniqueid: Unique ID of the SCCM application.</td>
</tr>
<tr>
<td></td>
<td>• name: Name of the application.</td>
</tr>
<tr>
<td></td>
<td>• manufacturer: Manufacturer of the application.</td>
</tr>
<tr>
<td></td>
<td>• version: Version of the application.</td>
</tr>
<tr>
<td></td>
<td>• isDeployable: True/false value indicating if this application is deployable.</td>
</tr>
<tr>
<td></td>
<td>• isDeployed: True/false value indicating if this application is already deployed.</td>
</tr>
<tr>
<td></td>
<td>• numberOfUsersWithApp: Count of users with this application installed.</td>
</tr>
<tr>
<td></td>
<td>• numberOfDevicesWithApp: Count of devices on which this application is installed.</td>
</tr>
<tr>
<td></td>
<td>• application: Object containing the data set listed above for this application. Use the script to parse additional data from this set that you might need.</td>
</tr>
<tr>
<td>error</td>
<td>Variable that contains the activity output error message.</td>
</tr>
</tbody>
</table>
Conditions

Table 875: Get Applications conditions

<table>
<thead>
<tr>
<th>Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully retrieved the list of applications available on the SCCM host.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to retrieve the list of applications available on the SCCM host.</td>
</tr>
</tbody>
</table>

Get Deployments activity

The Get Deployments activity returns the list of deployments performed by Orchestration using a Microsoft System Center Configuration Manager (SCCM) server.

The Get Deployments activity uses the Powershell activity template to access the deployments on the SCCM server. The activity is configured to use a MID Server with Powershell capabilities and to run a MID Server script called GetDeployments.ps1 that returns the deployments on the host. This script filters the results of the GET, so that only specific attributes are returned for the deployments on the SCCM server. Filtering the results in this manner controls the size of the payload, while providing the most desirable deployment data. The list of available deployments is returned as an array in a JSON object.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities System Center Configuration Manager (SCCM).

*Note:* The Get Deployments activity does not use pre-processing scripts.

Input variables

Table 876: Get Deployments input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sccmServer</td>
<td>The fully qualified domain name (FQDN) of the SCCM server.</td>
</tr>
</tbody>
</table>
Output variables

Table 877: Get Deployments output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
</table>
| deployments | The deployments array contains these attributes:  
|  | • id: Primary key of the SCCM application.  
|  | • applicationId: Primary key of the SCCM application.  
|  | • softwareName: Name of the software that will be deployed.  
|  | • collectionId: Primary key of the SCCM collection.  
|  | • collectionName: Name of the SCCM collection.  
|  | • desiredConfigType: Possible values are: Install (1) and Uninstall (2).  
|  | • deploymentIntent: Intended purpose of the deployment. Possible values are: Available (1) and Required (2).  
|  | • numberSuccess: Number of clients that successfully installed the deployment.  
|  | • numberErrors: Number of clients with an error when installing the deployment.  
|  | • deployment: Object containing the data set of attributes listed here for this deployment. Use the post-processing script to parse additional data from this set that you might need. |
| error      | Variable that contains the activity output error message. |

Conditions

Table 878: Get Deployments conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully retrieved the list of deployments performed by Orchestration using an SCCM host.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to retrieve the list of deployments performed by Orchestration using an SCCM host.</td>
</tr>
</tbody>
</table>
Get Device Collections activity

The Get Device Collections activity returns the list of available device collections on a Microsoft System Center Configuration Manager (SCCM) host.

The Get Device Collections activity uses the *Powershell activity template* to access the collections on the SCCM server. The activity is configured to use a MID Server with Powershell capabilities and to run a MID Server script called `GetDeviceCollections.ps1` that returns the device collections on the server. This script filters the results of the GET, so that only specific attributes are returned for the device collections on the SCCM server. Filtering the results in this manner controls the size of the payload, while providing the most desirable device collection data. The list of available collections is returned as an array in a JSON object.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities System Center Configuration Manager (SCCM).

---

**Note:** The Get Device Collections activity does not use pre-processing scripts.

Input variables

Table 879: Get Device Collections input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sccmServer</td>
<td>The fully qualified domain name (FQDN) of the SCCM server.</td>
</tr>
</tbody>
</table>

Output variables

Table 880: Get Device Collections output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>deviceCollections</td>
<td>The deviceCollections array contains these attributes:</td>
</tr>
<tr>
<td></td>
<td>• id: Primary key of the SCCM device collection.</td>
</tr>
<tr>
<td></td>
<td>• name: Name of the SCCM device collection.</td>
</tr>
<tr>
<td></td>
<td>• collectionType: Type of SCCM collection. In this case, the value is device.</td>
</tr>
<tr>
<td></td>
<td>• localMemberCount: Count of device collection members visible at the local SCCM site.</td>
</tr>
<tr>
<td></td>
<td>• memberCount: Count of all device collection members.</td>
</tr>
<tr>
<td></td>
<td>• deviceCollection: Object containing the data set of attributes listed here for this device collection. Use the post-processing script to parse additional data from this set to use.</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
</tr>
<tr>
<td>error</td>
<td>Variable that contains the activity output error message.</td>
</tr>
</tbody>
</table>

Conditions

Table 881: Get Device Collections conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully retrieved a list of device collections available on the SCCM host.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to retrieve a list of device collections available on the SCCM host.</td>
</tr>
</tbody>
</table>

Get User Collections activity

The Get User Collections activity returns the list of available user collections on a Microsoft System Center Configuration Manager (SCCM) server.

The Get User Collections activity uses the *Powershell activity template* to access the user collections on the SCCM server. The activity is configured to use a MID Server with Powershell capabilities and to run a MID Server script called GetUserCollections.ps1 that returns the user collections on the host. This script filters the results of the GET, so that only specific attributes are returned for the user collections on the SCCM server. Filtering the results in this manner controls the size of the payload, while providing the most desirable user collection data. The list of available collections is returned as an array in a JSON object.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities System Center Configuration Manager (SCCM) .

**Note:** The Get User Collections activity does not use pre-processing scripts.

Input variables

Table 882: Get User Collections input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sccmServer</td>
<td>The fully qualified domain name (FQDN) of the SCCM server.</td>
</tr>
</tbody>
</table>
Output variables

Table 883: Get User Collections output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>userCollections</td>
<td>The userCollections array contains these attributes:</td>
</tr>
<tr>
<td></td>
<td>• id: Primary key of the SCCM user collection.</td>
</tr>
<tr>
<td></td>
<td>• name: Name of the SCCM user collection.</td>
</tr>
<tr>
<td></td>
<td>• collectionType: Type of SCCM collection. In this case, the value is user.</td>
</tr>
<tr>
<td></td>
<td>• localMemberCount: Count of user collection members visible at the local SCCM site.</td>
</tr>
<tr>
<td></td>
<td>• memberCount: Count of all user collection members.</td>
</tr>
<tr>
<td></td>
<td>• userCollection: Object containing the data set of attributes listed here for this user collection. Use the post-processing script to parse additional data from this set to use.</td>
</tr>
<tr>
<td>error</td>
<td>Variable that contains the activity output error message.</td>
</tr>
</tbody>
</table>

Conditions

Table 884: Get User Collections conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully retrieved the list of available user collections on an SCCM host.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to retrieve the list of available user collections on an SCCM host.</td>
</tr>
</tbody>
</table>

Is Device in Collection activity

This activity verifies if a device exists in an SCCM device collection.

The Is Device in Collection activity uses the PowerShell activity template to verify if a specific device exists in an SCCM device collection. The activity is configured to use a MID Server with PowerShell capabilities and to run a MID Server script called IsDeviceInCollection.ps1 to perform the test.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities System Center Configuration Manager (SCCM).
### Input variables

Table 885: Is Device in Collection input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sccmServer</td>
<td>The fully qualified domain name (FQDN) of the SCCM server.</td>
</tr>
<tr>
<td>collection</td>
<td>Name of the device collection.</td>
</tr>
<tr>
<td>device</td>
<td>Name of the device to verify is in the collection.</td>
</tr>
</tbody>
</table>

### Output variables

Table 886: Is Device in Collection output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>output</td>
<td>Variable that contains the test result: True/False</td>
</tr>
<tr>
<td>errorMessage</td>
<td>Variable that contains the activity output error message.</td>
</tr>
</tbody>
</table>

### Conditions

Table 887: Is Device in Collection conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exist</td>
<td>The device exists in the collection.</td>
</tr>
<tr>
<td>Not exist</td>
<td>The device does not exist in the collection.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed.</td>
</tr>
</tbody>
</table>

### Is User in Collection activity

This activity verifies if a user exists in an SCCM user collection.

The Is User in Collection activity uses the *PowerShell activity template* to verify if a specific user exists in an SCCM user collection. The activity is configured to use a MID Server with PowerShell capabilities and to run a MID Server script called IsUserInCollection.ps1 to perform the test.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities System Center Configuration Manager (SCCM).
Input variables

Table 888: Is User in Collection input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sccmServer</td>
<td>The fully qualified domain name (FQDN) of the SCCM server.</td>
</tr>
<tr>
<td>collection</td>
<td>Name of the user collection.</td>
</tr>
<tr>
<td>user</td>
<td>Name of the user to verify is in the collection.</td>
</tr>
</tbody>
</table>

Output variables

Table 889: Is User in Collection output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>output</td>
<td>Variable that contains the test result: True/False</td>
</tr>
<tr>
<td>errorMessage</td>
<td>Variable that contains the activity output error message.</td>
</tr>
</tbody>
</table>

Conditions

Table 890: Is User in Collection conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exist</td>
<td>The user exists in the collection.</td>
</tr>
<tr>
<td>Not exist</td>
<td>The user does not exist in the collection.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed.</td>
</tr>
</tbody>
</table>

Remove from Device Collection activity

The Remove from Device Collection activity removes a device from a Microsoft System Center Configuration Manager (SCCM) device collection.

The Remove from Device Collection activity uses the `Powershell activity template` to remove a device from a device collection on a Microsoft SCCM server. The activity is configured to use a MID Server with Powershell capabilities and to run a MID Server script called `RemoveFromUserCollection.ps1` to edit the collection.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities System Center Configuration Manager (SCCM).
Input variables

Table 891: Remove from Device Collection input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sccmServer</td>
<td>The fully qualified domain name (FQDN) of the SCCM server.</td>
</tr>
<tr>
<td>collection</td>
<td>Name of the device collection.</td>
</tr>
<tr>
<td>device</td>
<td>Name of the device to add to the collection.</td>
</tr>
</tbody>
</table>

Output variables

Table 892: Remove from Device Collection output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>output</td>
<td>Variable that contains a value that is passed to other activities in the workflow</td>
</tr>
<tr>
<td>error</td>
<td>Variable that contains the activity output error message.</td>
</tr>
</tbody>
</table>

Conditions

Table 893: Remove from Device Collection conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully removed the device from the SCCM device collection.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to remove the device from the SCCM device collection.</td>
</tr>
</tbody>
</table>

Remove from User Collection activity

The Remove from User Collection activity removes a user from a Microsoft System Center Configuration Manager (SCCM) user collection.

The Remove from User Collection activity uses the Powershell activity designer template to access a user collection on a Microsoft SCCM target host. The activity is configured to use a MID Server with Powershell capabilities and to run a MID Server script called RemoveFromUserCollection.ps1 to edit the collection.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities System Center Configuration Manager (SCCM).
Input variables

Table 894: Remove from User Collection input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sccmServer</td>
<td>The fully qualified domain name (FQDN) of the SCCM server.</td>
</tr>
<tr>
<td>collection</td>
<td>Name of the user collection.</td>
</tr>
<tr>
<td>user</td>
<td>Name of the user to add to the collection.</td>
</tr>
</tbody>
</table>

Output variables

Table 895: Remove from User Collection output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>output</td>
<td>Variable that contains a value that is passed to other activities in the workflow.</td>
</tr>
<tr>
<td>error</td>
<td>Variable that contains the activity output error message.</td>
</tr>
</tbody>
</table>

Conditions

Table 896: Remove from User Collection conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully removed the user from the SCCM user collection.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to remove the user from the SCCM user collection.</td>
</tr>
</tbody>
</table>

SFTP File Transfer activity pack

Use the SFTP File Transfer activities to manage files and directories on an SFTP server and to move files from one SFTP server to another.

The SFTP activity pack includes scoped activities for common file transfer tasks and a ready-to-use workflow that includes these activities. Use the SFTP workflow to control which files are going to be moved, what conditions the files need to meet, the order in which the files are moved, and which overwrite options are executed.

Note: To use the SFTP File Transfer activities and workflow, you must request activation of the Orchestration - SFTP plugin.
SFTP File Transfer workflow

The SFTP File Transfer activity pack includes a scoped workflow that uses multiple activities to manage files on SFTP servers.

The maximum activity count for the SFTP File Transfer workflow is set to 10,000. This allows the workflow to move up to 1000 files from one server to another.

Accessing the workflow

- Navigate to Workflow Workflow Editor and select the Workflows tab.
- Click on the SFTP File Transfer workflow to open it.
- Click the information icon in the workflow header to display the properties dialog box.

Input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source host</td>
<td>Name or IP address of the server containing the files you want to move.</td>
<td></td>
</tr>
<tr>
<td>Source port</td>
<td>Port number to use to communicate with the source server.</td>
<td>22</td>
</tr>
<tr>
<td>Source directory</td>
<td>Full path to the directory where the source files are located.</td>
<td></td>
</tr>
<tr>
<td>Source files</td>
<td>Names of specific source files to move. Separate the file names in this list with semi-colons. This field supports the use of wild cards. For information about how the values in this field are affected by options in other fields, see the section below the table.</td>
<td></td>
</tr>
<tr>
<td>Excluded files</td>
<td>Names of specific source files to exclude from the move. The system moves all other files found in the source directory or subfolders. Separate the file names in this list with semi-colons. This field supports the use of wild cards. For information about how the values in this field are affected by options in other fields, see the section below the table.</td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target host</td>
<td>Name or IP address of the server to which the files are being moved.</td>
<td></td>
</tr>
<tr>
<td>Target port</td>
<td>Port number to use to communicate with the target host.</td>
<td>22</td>
</tr>
<tr>
<td>Datetime format</td>
<td>Timestamp format to apply when the $[DateTime]$ variable is used in the Target directory or Target files field. The system uses the current time from the instance to create timestamp values.</td>
<td>yyyy-MM-dd</td>
</tr>
<tr>
<td>Target directory</td>
<td>Path to the directory in the target host where the files are being moved. You can specify a target directory whose name includes the timestamp by adding the $[DateTime]$ variable to the directory name. For example, you might enter this path to a target directory: /user/jacinto.gawron/documents/projects_ $[DateTime]$. This produces the projects_20150505 directory. When the timestamp variable is used, the system uses the format specified in the Datetime format field.</td>
<td></td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
<td>Default value</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------</td>
</tr>
</tbody>
</table>
| Target file                    | Format to use for target file names when a timestamp is added. You can configure the system to add the timestamp as a prefix to the file name or insert the timestamp into the name, using these variables:  
  • \$[DateTime]: Current timestamp, using the format defined in the Datetime format field.  
  • \$[SourceFile]: Complete file name.  
  • \$[SourceFile:Base]: Base file name without the extension.  
  • \$[SourceFile:Ext]: File extension only.  
  A target file name with the timestamp added as a prefix is expressed as: \$[DateTime]_\$[SourceFile]. This produces a file name that looks like this: 20150505_file1.txt  
  A target file name with the timestamp inserted into the name is expressed as: \$[SourceFile:Base]_\$[DateTime]$_[SourceFile:Ext]. This produces a file name that looks like this: file1_20150505.txt | false         |
<p>| Apply move conditions          | Check box to apply conditions to the file transfer. If this check box is selected, additional fields appear for setting conditions.                                                                                                                                                                                                                     | false         |
| Minimum file size, in bytes    | Condition that defines a target file's minimum size requirement. This setting can help determine if the file is valid. This field appears when the Apply move conditions check box is selected.                                                                                                                                                                | 0             |
| Maximum file size, in bytes    | Condition that defines a target file's maximum size requirement. This field appears when the Apply move conditions check box is selected.                                                                                                                                                                                                   | -1            |</p>
<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>File is not older than</td>
<td>Condition that sets the earliest acceptable date for this file's age range. The range starts at 00:00 (midnight) on the date specified. This field appears when the Apply move conditions check box is selected.</td>
<td></td>
</tr>
<tr>
<td>File is not newer than</td>
<td>Condition that sets the latest acceptable date for this file's age range. The range ends at 23:59 on the date specified. This field appears when the Apply move conditions check box is selected.</td>
<td></td>
</tr>
<tr>
<td>Include subfolders</td>
<td>Check box to move the files from subfolders in the source directory. For information about how your selection affects other fields in the form, see the section below the table.</td>
<td></td>
</tr>
<tr>
<td>Move order</td>
<td>Order in which the files are moved from the source to the target. The possible options are:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• None (same order as files in the source directory)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• By timestamp</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• By file name</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• By file size</td>
<td></td>
</tr>
<tr>
<td>Sort order</td>
<td>Order in which the files are sorted in the target directory, using the option selected in the Move order field. Sorting options are Ascending and Descending.</td>
<td><code>desc</code></td>
</tr>
<tr>
<td>Maximum number of retries</td>
<td>Number of attempts the activity can make to connect to the target host or to move a file before timing out. When the retry limit to move a file or to connect to the host is exceeded, the system logs a failure. If the maximum number of failures is not exceeded, the system attempts to connect again or to move the next file named.</td>
<td><code>2</code></td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
<td>Default value</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Time between retries, in seconds</td>
<td>Time, in seconds, between repeat attempts to connect to the target or to begin moving a file.</td>
<td>10</td>
</tr>
<tr>
<td>Maximum number of failures</td>
<td>Acceptable number of times the system can fail to connect to the target host or to move a file before it quits trying. A failure occurs when the number of configured retries is exceeded. Using the default settings, failure occurs when the system cannot connect to the target or move a file after two retries.</td>
<td>0</td>
</tr>
<tr>
<td>Duplicate file action</td>
<td>Action to take if a file being moved already exists in the target directory. The choices are:</td>
<td>overwrite</td>
</tr>
<tr>
<td></td>
<td>• Overwrite if file exists (default)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Rename with index</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Do not move</td>
<td></td>
</tr>
<tr>
<td>Preserve file attributes</td>
<td>Check box to use the time stamp and mode information from the source files for the copied files. If this check box is cleared, the copied files have a current time stamp and mode.</td>
<td>false</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This timestamp is a file attribute and is not appended to the file name.</td>
<td></td>
</tr>
<tr>
<td>Upon success, remove files from source</td>
<td>Check box to delete original files from the source directory when they are copied to the new location. Clear this check box to keep the source files in their current location in the source host.</td>
<td>false</td>
</tr>
<tr>
<td>Upon failure, keep moved files on target</td>
<td>Check box to keep any files on the target that were moved successfully, even if the entire file transfer operation ended in failure. If this check box is cleared, the system removes all successfully transferred files from the target when general failure occurs.</td>
<td>true</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
<td>Default value</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Credential tag for source</td>
<td>Specific credential alias this activity must use to run SSH commands on the source host.</td>
<td></td>
</tr>
<tr>
<td>Credential tag for target</td>
<td>Specific credential tag this activity must use to run SSH commands on the target host.</td>
<td></td>
</tr>
</tbody>
</table>

**File selection logic**

When selecting the files to move from the source host, the system uses this logic:

- If the Source files and Excluded files fields are empty, the system moves all the files in the source directory.
- When the Include subfolders check box is selected, the following dependencies exist:
  - If no files are specified in the Source files and Exclude files fields, the system moves all files in the source directory and all files in all subfolders of the source directory.
  - If the Source files field contains file names, the system moves those files from their location on either the source directory or any of its subfolders.
  - If the Exclude files field contains file names, the system moves all the files from the source directory and its subfolders except those excluded files.
- When the Include subfolders check box is cleared, the system looks only in the source directory for files to move or exclude.

**Copy File activity**

The Copy File activity copies a file from an SFTP server (source host) to another SFTP server (target host).

**Input variables**

**Table 898: Copy File input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sourceHost</td>
<td>Name or IP address of the server containing the files you want to transfer.</td>
</tr>
<tr>
<td>sourcePort</td>
<td>Port number to use to communicate with the source server. The default port number is 22.</td>
</tr>
<tr>
<td>sourceFilePath</td>
<td>Full path to the file to copy from the source host.</td>
</tr>
<tr>
<td>targetHost</td>
<td>Name or IP address of the server to which you want to move the files.</td>
</tr>
<tr>
<td>targetPort</td>
<td>Port number to use to communicate with the target server. The default port number is 22.</td>
</tr>
<tr>
<td>targetFilePath</td>
<td>Full path to the copied file on the target host.</td>
</tr>
</tbody>
</table>
Variable | Description
---|---
tempFileSuffix | Temporary suffix to use when moving a file. If this field contains a value, the activity deletes the duplicate target file, if it exists, and then copies the source file to a temporary file using targetFilePath + tempFileSuffix as the name. Upon completion, the activity renames the file to the actual target file name. If this field is blank, the activity copies the source file directly to the target file and overwrites it, if it already exists.
sourceCredentialTag | Specific credential alias this activity must use to run SSH commands on the source host.
targetCredentialTag | Specific credential tag this activity must use to run SSH commands on the target host.

Output variables

Table 899: Copy File output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>errorMessages</td>
<td>The executionResult.errorMessages from the Activity designer parsing sources on page 2018. If this variable is not null, the operation has failed.</td>
</tr>
<tr>
<td>result</td>
<td>Text message advising that the command was executed successfully.</td>
</tr>
</tbody>
</table>

Conditions

Table 900: Copy File conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The activity succeeded in copying the file.</td>
</tr>
<tr>
<td>Failure</td>
<td>The activity failed to copy the file.</td>
</tr>
</tbody>
</table>

Create Directory activity

The Create Directory activity creates a new directory on an SFTP server.
Input variables

Table 901: Create Directory input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sourceHost</td>
<td>Name or IP address of the server containing the files you want to move.</td>
</tr>
<tr>
<td>sourcePort</td>
<td>Port number to use to communicate with the source server. The default port number is 22.</td>
</tr>
<tr>
<td>sourceDirectory</td>
<td>Path to the target directory to create.</td>
</tr>
<tr>
<td>sourceCredentialTag</td>
<td>Specific &lt;i&gt;credential alias&lt;/i&gt; this activity must use to run SSH commands on the host.</td>
</tr>
</tbody>
</table>

Output variables

Table 902: Create Directory output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>errorMessage</td>
<td>The executionResult.errorMessages from the Activity designer parsing sources on page 2018. If this variable is not null, the operation has failed.</td>
</tr>
<tr>
<td>result</td>
<td>Text message advising that the command was executed successfully.</td>
</tr>
</tbody>
</table>

Conditions

Table 903: Create Directory conditions

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The activity succeeded in creating the directory.</td>
</tr>
<tr>
<td>Failure</td>
<td>The activity failed to create the directory.</td>
</tr>
</tbody>
</table>

Get File List activity

The Get File List activity returns a list of files from a given directory and its subdirectories on an SFTP server (source host).
### Input variables

**Table 904: Get File List input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sourceHost</td>
<td>Name or IP address of the server containing the files you want to list.</td>
</tr>
<tr>
<td>sourcePort</td>
<td>Port number to use to communicate with the target server. The default port number is 22.</td>
</tr>
<tr>
<td>sourceDirectory</td>
<td>Path to the target directory containing the files to list.</td>
</tr>
<tr>
<td>sourceFiles</td>
<td>List of target files to return. This is a comma separated list that accepts wildcards, such as *.txt.</td>
</tr>
<tr>
<td>excludedFiles</td>
<td>List of target files to exclude. This is a comma separated list that accepts wildcards, such as *.txt.</td>
</tr>
<tr>
<td>includeSubfolders</td>
<td>True/false variable that determines if files from subfolders are included in the list. The default value for this variable is false.</td>
</tr>
<tr>
<td>sourceCredentialTag</td>
<td>Specific credential alias this activity must use to run SSH commands on the host.</td>
</tr>
</tbody>
</table>

### Output variables

**Table 905: Get File List output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>errorMessage</td>
<td>The executionResult.errorMessages from the Activity designer parsing sources on page 2018. If this variable is not null, the operation has failed. An activity can examine the error message to customize a condition. For example, if the error message contains NO_SUCH_FILE, the activity can be considered successful, depending on circumstances.</td>
</tr>
<tr>
<td>result</td>
<td>List of requested files, returned as a JSON string.</td>
</tr>
</tbody>
</table>
Conditions

Table 906: Get File List conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The activity succeeded in listing the requested files.</td>
</tr>
<tr>
<td>Failure</td>
<td>The activity failed to list the requested files.</td>
</tr>
</tbody>
</table>

Remove File or Directory activity

The Remove File or Directory activity removes a file or a directory on an SFTP server, including subdirectories, when configured.

Input variables

Table 907: Remove File or Directory input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sourceHost</td>
<td>Name or IP address of the server containing the files you want to remove.</td>
</tr>
<tr>
<td>sourcePort</td>
<td>Port number to use to communicate with the target server. The default port number is 22.</td>
</tr>
<tr>
<td>sourceFilePath</td>
<td>Full path to the file or directory to remove. To remove multiple files or directories using a single activity, enter a semicolon-separated list of paths in this field.</td>
</tr>
<tr>
<td>isDirectory</td>
<td>True/false variable that determines if the specified file path is a directory. The default value for this variable is false.</td>
</tr>
<tr>
<td>includeSubfolders</td>
<td>True/false variable that determines if the given directory and all of its subfolders should be removed. The default value for this variable is false. If the value for this field is false, then the activity can only remove an empty directory. This field appears when the isDirectory checkbox is selected.</td>
</tr>
<tr>
<td>sourceCredentialTag</td>
<td>Specific credential alias this activity must use to run SSH commands on the host.</td>
</tr>
</tbody>
</table>
Output variables

Table 908: Remove File or Directory output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>errorMessage</td>
<td>The executionResult.errorMessages from the Activity designer parsing sources on page 2018. If this variable is not null, the operation has failed.</td>
</tr>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>deletionResults</td>
<td>The deletionResults array contains these attributes:</td>
</tr>
<tr>
<td></td>
<td>• fullPath: Full path to the file or directory targeted.</td>
</tr>
<tr>
<td></td>
<td>• status: Either succeeded or failed.</td>
</tr>
<tr>
<td></td>
<td>• reason: Text message describing the cause of a failure.</td>
</tr>
</tbody>
</table>

Conditions

Table 909: Remove File or Directory conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The activity succeeded in removing the file or directory specified.</td>
</tr>
<tr>
<td>Failure</td>
<td>The activity failed to remove the file or directory specified.</td>
</tr>
</tbody>
</table>

Rename File or Directory activity

The Rename File or Directory activity renames a file or directory to a new name on an SFTP server.

Input variables

Table 910: Rename File or Directory input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sourceHost</td>
<td>Name or IP address of the server containing the file or directory you want to rename.</td>
</tr>
<tr>
<td>sourcePort</td>
<td>Port number to use to communicate with the target server. The default port number is 22.</td>
</tr>
<tr>
<td>sourceFilePath</td>
<td>Full path to the file or directory to rename.</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>targetFilePath</td>
<td>Full path to the renamed file or directory.</td>
</tr>
<tr>
<td>sourceCredentialTag</td>
<td>Specific credential alias this activity must use to run SSH commands on the host.</td>
</tr>
</tbody>
</table>

### Output variables

#### Table 911: Rename File or Directory output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>errorMessages</td>
<td>The executionResult.errorMessages from the Activity designer parsing sources on page 2018. If this variable is not null, the operation has failed.</td>
</tr>
<tr>
<td>result</td>
<td>A message saying that the operation has been successful. For example, you might see: Rename /tmp/sftp_test/subdir1 to /tmp/sftp_test/subdir2 complete.</td>
</tr>
</tbody>
</table>

### Conditions

#### Table 912: Rename File or Directory conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The activity succeeded in renaming the file or directory.</td>
</tr>
<tr>
<td>Failure</td>
<td>The activity failed to rename the file or directory.</td>
</tr>
</tbody>
</table>

### Set File Attributes activity

The Set File Attributes activity sets common file attributes, such as timestamps, size, permissions, and UID/GID, for a file or directory on an SFTP server.

A good practice is to use the Get File List activity to return a list of files and their attributes first. Then, when you moved a file from a source host to a target host, use the Set File Attributes activity to set the source file attributes on the target file. This is demonstrated in the SFTP File Transfer workflow.
## Input variables

**Table 913: Set File Attributes input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sourceHost</td>
<td>Name or IP address of the server containing the file or directory whose attributes you want to change.</td>
</tr>
<tr>
<td>sourcePort</td>
<td>Port number to use to communicate with the target server. The default port number is 22.</td>
</tr>
<tr>
<td>sourceFilePath</td>
<td>Full path to the file or directory whose attributes you want to change.</td>
</tr>
<tr>
<td>userID</td>
<td>User ID attribute to apply to the file or directory. The UID and GUID variables must be set together as a pair.</td>
</tr>
<tr>
<td>groupID</td>
<td>Group ID attribute to apply to the file or directory. The UID and GUID variables must be set together as a pair.</td>
</tr>
<tr>
<td>permissions</td>
<td>File or directory permissions to set for the user and group specified. This value must be expressed as an integer, such as 16877, which defines these permissions: rwxr-xr-x.</td>
</tr>
<tr>
<td>accessTimestamp</td>
<td>Override the timestamp when the file or directory was last accessed. The access and modification timestamps must be set together as a pair.</td>
</tr>
<tr>
<td>modificationTimestamp</td>
<td>Override the timestamp when the file or directory was last modified. The access and modification timestamps must be set together as a pair.</td>
</tr>
<tr>
<td>sizeInBytes</td>
<td>Size of the file or directory, expressed in bytes.</td>
</tr>
<tr>
<td>sourceCredentialTag</td>
<td>Specific credential alias this activity must use to run SSH commands on the host.</td>
</tr>
</tbody>
</table>
Output variables

Table 914: Set File Attributes output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>errorMessage</td>
<td>The executionResult.errorMessages from the Activity designer parsing sources on page 2018. If this variable is not null, the operation has failed.</td>
</tr>
<tr>
<td>result</td>
<td>Text message advising that the command was executed successfully.</td>
</tr>
</tbody>
</table>

Conditions

Table 915: Set File Attributes conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The activity succeeded in changing the attributes of the specified file or directory.</td>
</tr>
<tr>
<td>Failure</td>
<td>The activity failed to change the attributes of the specified file or directory.</td>
</tr>
</tbody>
</table>

SSH activity pack

Orchestration provides an activity pack of SSH activities that were customized using the ServiceNow activity designer.

These activities perform the same functions as SSH activities by the same name from previous releases and replace those activities for all new workflows. The custom SSH activities were built with the Create an SSH activity on page 2088, which gives workflow administrators the ability to store input and output variables in the databus.

Note: Existing workflows from earlier versions that were created with legacy SSH activities continue to function normally after an upgrade to Geneva. However, all new workflows must use these custom SSH activities.

To use the SSH custom activities, you must request activation of the Orchestration - SSH plugin.

Secure Copy activity

The Secure Copy activity copies a file from one host to another, without storing the copied file on the MID Server.

This activity replaces an SSH activity by the same name available in releases prior to Geneva. If you have a workflow created in a previous version that uses the deprecated activity, your workflow will continue to work normally after upgrading to Geneva. However, all new workflows must use the custom version of this activity. This activity was built with the SSH activity designer template, which gives workflow administrators the ability to store input and output variables in the databus.
**Input variables**

Table 916: Secure Copy input variables

<table>
<thead>
<tr>
<th>Input variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>from_host</td>
<td>Host name or IP address of the source machine.</td>
</tr>
<tr>
<td>from_scp_file</td>
<td>Name of the file to copy, including the absolute path.</td>
</tr>
<tr>
<td>to_host</td>
<td>Host name or IP address of the target machine.</td>
</tr>
<tr>
<td>to_scp_file</td>
<td>Path to the target file. This path can be absolute or relative to the logged in user's home directory.</td>
</tr>
<tr>
<td>debug_mid</td>
<td>Check box that enables debug logging when selected.</td>
</tr>
<tr>
<td>debug_ssh</td>
<td>Check box that enables J2SSH debug logging when selected.</td>
</tr>
</tbody>
</table>

**Output variables**

Table 917: Secure Copy output variables

<table>
<thead>
<tr>
<th>Output variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>payload</td>
<td>The executionResult.payload from the Activity designer parsing sources on page 2018.</td>
</tr>
<tr>
<td>output</td>
<td>The executionResult.output from the parsing sources.</td>
</tr>
</tbody>
</table>

**Conditions**

Table 918: Secure Copy conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully copied the file from one host to another.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to copy the file from one host to another.</td>
</tr>
</tbody>
</table>

**Files Compare activity**

The Files Compare activity compares two files on a Linux or UNIX computer.

This activity replaces an SSH activity by the same name available in releases prior to Geneva. If you have a workflow created in a previous version that uses the deprecated activity, your workflow will continue to work normally after upgrading to Geneva. However, all new workflows must use the custom version of this
activity. This activity was built with the *SSH activity designer template*, which gives workflow administrators the ability to store input and output variables in the *databus*.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Global Orchestration - SSH.

### Input variables

**Table 919: Files Compare input variables**

<table>
<thead>
<tr>
<th>Input variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hostname</td>
<td>Hostname or IP address of the destination server for SSH activity.</td>
</tr>
<tr>
<td>Directory</td>
<td>Name of the working directory.</td>
</tr>
<tr>
<td>OldFile</td>
<td>Name of the first file to compare.</td>
</tr>
<tr>
<td>NewFile</td>
<td>Name of the second file to compare.</td>
</tr>
</tbody>
</table>

### Output variables

**Table 920: Files Compare output variables**

<table>
<thead>
<tr>
<th>Output variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>contents</td>
<td>File comparison result. This is the difference of the two compared files.</td>
</tr>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>return-code</td>
<td>Either 0, if the two files are the same, or 1, if the two files are different.</td>
</tr>
<tr>
<td>errorMessage</td>
<td>The executionResult.errorMessages from the <em>Activity designer parsing sources</em> on page 2018.</td>
</tr>
</tbody>
</table>

### Conditions

**Table 921: Files Compare conditions**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully compared the specified files.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity could not compare the specified files.</td>
</tr>
</tbody>
</table>

**File Read activity**

The File Read activity reads a file on a Linux or UNIX computer.
This activity replaces an SSH activity by the same name available in releases prior to Geneva. If you have a workflow created in a previous version that uses the deprecated activity, your workflow will continue to work normally after upgrading to Geneva. However, all new workflows must use the custom version of this activity. This activity was built with the [SSH activity designer template](#), which gives workflow administrators the ability to store input and output variables in the databus.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Global Orchestration - SSH.

### Input variables

**Table 922: File read input variables**

<table>
<thead>
<tr>
<th>Input variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hostname</td>
<td>Hostname or IP address of the destination server for SSH activity.</td>
</tr>
<tr>
<td>Directory</td>
<td>Name of the working directory.</td>
</tr>
<tr>
<td>File</td>
<td>The name of the file to read.</td>
</tr>
</tbody>
</table>

### Output variables

**Table 923: File read output variables**

<table>
<thead>
<tr>
<th>Output variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>contents</td>
<td>Content of the file to read.</td>
</tr>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
<tr>
<td>errorMessage</td>
<td>The executionResult.errorMessages from the Activity designer parsing sources on page 2018.</td>
</tr>
</tbody>
</table>

### Conditions

**Table 924: File Read conditions**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully read the contents of the specified file.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity could not read the contents of the specified file.</td>
</tr>
</tbody>
</table>

### File Write activity

The File Write activity writes a file on a Linux or UNIX computer.
The source file can be an absolute or relative path from the Directory. If an absolute path is used, then no value is required in the Directory field.

This activity replaces an SSH activity by the same name available in releases prior to Istanbul. If you have a workflow created in a previous version that uses the deprecated activity, your workflow will continue to work normally after upgrading to Istanbul. However, all new workflows must use the custom version of this activity. This activity was built with the SSH activity template, which gives workflow administrators the ability to store input and output variables in the databus.

**Input variables**

**Table 925: File Write input variables**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>hostname</td>
<td>Hostname or IP address of destination server for SSH activity.</td>
</tr>
<tr>
<td>directory</td>
<td>Name of the working (target) directory.</td>
</tr>
<tr>
<td>file</td>
<td>Name of the file to be written.</td>
</tr>
<tr>
<td>behavior</td>
<td>Select one of the following:</td>
</tr>
<tr>
<td></td>
<td>• overwrite: Creates the file if it does not exist and overwrites the file if it does exist.</td>
</tr>
<tr>
<td></td>
<td>• append: Creates the file if it does not exist and appends the new content to an existing file.</td>
</tr>
<tr>
<td></td>
<td>• create only: Creates the file if it does not exist and fails if the file does exist.</td>
</tr>
<tr>
<td>contents</td>
<td>What to write or append (depending on the behavior) to the file</td>
</tr>
</tbody>
</table>

**Output variables**

**Table 926: File Write output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>return_code</td>
<td>Indicates whether or not the file write operation was successful.</td>
</tr>
<tr>
<td>error_message</td>
<td>Message that indicates if an error has occurred. Any value other than 0 indicates a failure.</td>
</tr>
</tbody>
</table>
### Conditions

**Table 927: File Write conditions**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The activity wrote a file in the target directory.</td>
</tr>
<tr>
<td>Failure</td>
<td>The activity failed to write a file in the target directory.</td>
</tr>
</tbody>
</table>

### File Copy activity

The custom File Copy activity copies a file on a Linux or UNIX computer.

This activity replaces an SSH activity by the same name available in releases prior to Geneva. If you have a workflow created in a previous version that uses the deprecated activity, your workflow will continue to work normally after upgrading to Geneva. However, all new workflows must use the custom version of this activity. This activity was built with the [SSH activity designer template](#), which gives workflow administrators the ability to store input and output variables in the **databus**.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Global Orchestration - SSH.

### Input variables

**Table 928: File Copy input variables**

<table>
<thead>
<tr>
<th>Input variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>hostname</td>
<td>Hostname or IP address of destination server for SSH activity.</td>
</tr>
<tr>
<td>directory</td>
<td>Name of the working directory.</td>
</tr>
<tr>
<td>src_file</td>
<td>Name of the source file.</td>
</tr>
<tr>
<td>dst_file</td>
<td>The name of the destination file.</td>
</tr>
</tbody>
</table>

### Output variables

**Table 929: File Copy output variables**

<table>
<thead>
<tr>
<th>Output variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
</tbody>
</table>
Conditions

Table 930: File Copy conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully copied the file on the specified host.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to copy the file on the specified host.</td>
</tr>
</tbody>
</table>

File Replace String activity

The File Replace String activity finds and replaces a string in a file on a Linux or UNIX computer.

This activity replaces an SSH activity by the same name available in releases prior to Istanbul. If you have a workflow created in a previous version that uses the deprecated activity, your workflow will continue to work normally after upgrading to Istanbul. However, all new workflows must use the custom version of this activity. This activity was built with the SSH activity template, which gives workflow administrators the ability to store input and output variables in the databus.

Input variables

Table 931: File Replace String input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>hostname</td>
<td>Hostname or IP address of destination server for SSH activity.</td>
</tr>
<tr>
<td>directory</td>
<td>Name of the working (target) directory.</td>
</tr>
<tr>
<td>file</td>
<td>Name of the file in which the string is to be replaced.</td>
</tr>
<tr>
<td>find_pattern</td>
<td>A regular expression of the text to replace.</td>
</tr>
<tr>
<td>replace_string</td>
<td>The replacement string for the text found by the expression in the find_pattern variable.</td>
</tr>
<tr>
<td>options</td>
<td>Replacement options:</td>
</tr>
<tr>
<td></td>
<td>• first: Replaces the first occurrence of the pattern.</td>
</tr>
<tr>
<td></td>
<td>• all: Replaces all occurrences of the pattern.</td>
</tr>
</tbody>
</table>
Output variables

Table 932: File Replace String output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>return_code</td>
<td>Indicates whether or not the string was replaced successfully in the target file.</td>
</tr>
<tr>
<td>error_message</td>
<td>Message that indicates if an error has occurred. Any value other than 0 indicates a failure.</td>
</tr>
</tbody>
</table>

Conditions

Table 933: File Replace String conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The activity has successfully replaced the string in the file.</td>
</tr>
<tr>
<td>Failure</td>
<td>The activity has failed to replaced the string in the file.</td>
</tr>
</tbody>
</table>

Reset Linux User Password activity

The Reset Linux User Password activity resets the password for a given user on a Linux computer.

This activity requires that the user executing the command be able to run the chpasswd command and, if expiring the password immediately, to run chage with *sudo privileges*.

This activity replaces an SSH activity by the same name available in releases prior to Istanbul. If you have a workflow created in a previous version that uses the deprecated activity, your workflow will continue to work normally after upgrading to Istanbul. However, all new workflows must use the custom version of this activity. This activity was built with the *SSH activity template*, which gives workflow administrators the ability to store input and output variables in the *databus*.

Input variables

Table 934: Reset Linux User Password input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>hostname</td>
<td>IP address of the target Linux machine.</td>
</tr>
<tr>
<td>user</td>
<td>Name of the user whose password is being reset.</td>
</tr>
<tr>
<td>password</td>
<td>New password set for this user. The password is a workflow variable that is encrypted either as a password2 field or by calling the encryption method of a Packages.com.glide.util.Encrypter object.</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>force_change</td>
<td>Indicates if this password is temporary and to force the named user to change the password at login.</td>
</tr>
</tbody>
</table>

### Output variables

Table 935: Reset Linux User Password output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>return_code</td>
<td>Indicates whether or not the user password reset action was successful.</td>
</tr>
<tr>
<td>error_message</td>
<td>Describes any error that occurred during password reset. If no error occurred, this value is null.</td>
</tr>
</tbody>
</table>

### Conditions

Table 936: Reset Linux User Password conditions

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully changed specified user's password</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to change specified user's password.</td>
</tr>
</tbody>
</table>

### Workday Orchestration activity pack

The Workday Orchestration activity pack allows users to change and get employee information from Workday.

An Orchestration workflow can gather information such as an employee's phone number and email address from Workday and update the employee's sys_user record automatically.

To access each activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Workday Orchestration. For configuration details about the Workday integration, see Employee Orchestration on page 1828.

The Workday Orchestration activity pack is loaded with the Orchestration - Workday plugin, which is active by default with a subscription to Orchestration.

**Note:** This application is in custom scope. To run it globally, you must edit the activity.

### Get Employee Info activity

The Get Employee Info activity gets an employee's information from Workday.
To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Workday Orchestration. This activity was built with the SOAP Web Service activity template.

**Note:** Before using this activity, configure the SOAP message “Get Worker” with the SOAP endpoint, and update Workday credentials accordingly. To update Workday credentials, navigate to Employee Orchestration Workday Credential.

**Input variables**

**Table 937: Get Employee Info input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>employee_id</td>
<td>Workday employee ID.</td>
</tr>
</tbody>
</table>

**Output variables**

**Table 938: Get Employee Info output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>status_code</td>
<td>Contains the status code returned from the web service.</td>
</tr>
<tr>
<td>error</td>
<td>Returns the error string from the SOAP web service, unless there are no errors, in which case it returns null.</td>
</tr>
<tr>
<td>employee_wid</td>
<td>Employee system ID in Workday (e.g. 73528cac9c871079a947ebe000c72de2).</td>
</tr>
<tr>
<td>user_id</td>
<td>User ID in Workday (e.g. mgandhi).</td>
</tr>
<tr>
<td>first_name</td>
<td>Employee's first name.</td>
</tr>
<tr>
<td>last_name</td>
<td>Employee's last name.</td>
</tr>
<tr>
<td>employee_number</td>
<td>Workday employee ID.</td>
</tr>
<tr>
<td>first_day_of_work</td>
<td>Employee's first day of employment.</td>
</tr>
<tr>
<td>work_address</td>
<td>The work_address object contains the following attributes for work address information:</td>
</tr>
<tr>
<td></td>
<td>• address_line1 (e.g. 139 SE 88th Pl.)</td>
</tr>
<tr>
<td></td>
<td>• city (e.g. San Diego)</td>
</tr>
<tr>
<td></td>
<td>• state (e.g. CA)</td>
</tr>
<tr>
<td></td>
<td>• country: Three-letter country codes defined in ISO 3166-1 (e.g. USA)</td>
</tr>
<tr>
<td></td>
<td>• postal_code (e.g. 98054)</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| home_address| The home_address object contains the following attributes for home address information:  
• address_line1  
• city  
• state  
• country: Three-letter country codes defined in ISO 3166-1 (e.g. USA)  
• postal_code |
| work_phone  | The work_phone object contains the following attributes for work phone information:  
• international_phone_code: Country-specific International Phone Code (e.g. 1)  
• area_code: Area code for the phone number (e.g. 408)  
• phone_number: Phone number without the area code (e.g. 1234567) |
| cell_phone  | The cell_phone object contains the following attributes for cell phone information:  
• international_phone_code: Country-specific International Phone Code (e.g. 1)  
• area_code: Area code for the phone number (e.g. 408)  
• phone_number: Phone number without the area code (e.g. 1234567) |
| home_email  | Employee's home email address.                                                |
| work_email  | Employee's work email address.                                               |
| validation_error | Validation error returned from Workday, if any.                        |

### Conditions

**Table 939: Get Employee Info conditions**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee exists</td>
<td>This employee exists in the Workday instance.</td>
</tr>
<tr>
<td>Employee doesn't exist</td>
<td>This employee does not exist in the Workday instance, or the employee ID is not valid.</td>
</tr>
<tr>
<td>Failure</td>
<td>The activity failed to connect to the Workday instance.</td>
</tr>
</tbody>
</table>

### Update Employee Contact activity

The Update Employee Contact activity updates employee contact information in Workday.

To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Workday Orchestration. This activity was built with the SOAP Web Service activity template.
**Input variables**

Table 940: Update Employee Contact input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>employee_id</td>
<td>Workday employee ID.</td>
</tr>
<tr>
<td>effective_date</td>
<td>Date on which the employee information will be effective on Workday. The format for this value is yyyy-mm-dd.</td>
</tr>
<tr>
<td>email_address</td>
<td>Work email address for this employee.</td>
</tr>
</tbody>
</table>

**Output variables**

Table 941: Update Employee Contact output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>status_code</td>
<td>Contains the status code returned from the web service.</td>
</tr>
<tr>
<td>error</td>
<td>Returns the error string from the SOAP web service, unless there are no errors, in which case it returns null.</td>
</tr>
<tr>
<td>body</td>
<td>Contains a string value representing the output from the SOAP message.</td>
</tr>
</tbody>
</table>

**Conditions**

Table 942: Update Employee Contact conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully updated employee's email address on Workday</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to update employee's email address on Workday.</td>
</tr>
</tbody>
</table>

**Update Employee Work Email activity**

The Update Employee Work Email activity updates an employee's work email address in Workday.
To access this activity in the Workflow Editor, select the Custom tab, and then navigate to Custom Activities Workday Orchestration. This activity was built with the SOAP Web Service activity template.

**Note:** Before using this activity, configure the SOAP message “Get Worker” with the SOAP endpoint, and update Workday credentials accordingly. To update Workday credentials, navigate to Employee Orchestration Workday Credential.

### Input variables

**Table 943: Update Employee Work Email input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>employee_id</td>
<td>Workday employee ID.</td>
</tr>
<tr>
<td>effective_date</td>
<td>Date on which the employee work email address change is effective on Workday. The format for this value is yyyy-mm-dd.</td>
</tr>
<tr>
<td>email_address</td>
<td>Work email address</td>
</tr>
</tbody>
</table>

### Output variables

**Table 944: Update Employee Work Email output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>status_code</td>
<td>Contains the status code returned from the web service.</td>
</tr>
<tr>
<td>error</td>
<td>Returns the error string from the SOAP web service, unless there are no errors, in which case it returns null.</td>
</tr>
<tr>
<td>body</td>
<td>Contains a string value representing the output from the SOAP message.</td>
</tr>
</tbody>
</table>

### Conditions

**Table 945: Update Employee Work Email conditions**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity successfully updated the employee's work email address in Workday.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to update the employee's work email address in Workday.</td>
</tr>
</tbody>
</table>
Workday Orchestration GlideActions activities

The Workday Orchestration GlideActions activities take employee information returned from Workday and use it to create or update user records in the ServiceNow® instance.

The GlideAction activities were built with the Create a run script activity on page 2093.

Check User Exists activity

The Check User Exists activity checks the ServiceNow sys_user table to determine if a record exists for a new employee named in a Workday onboarding notification.

When the ServiceNow instance receives a notification from Workday that a new employee has been hired, Orchestraion runs a workflow called Employee On/Off Boarding to retrieve additional information about the new employee. This workflow uses the Check User Exists GlideActions activity to determine if a user record already exists for this employee on the instance. If a user record does exist, another GlideActions activity checks the sys_user record and updates it if necessary. If a user record does not exist, another activity in the workflow creates a new ServiceNow user record.

Input variables

Table 946: Check User Exists input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>employee_number</td>
<td>Employee identification number received from a Workday notification. This is the field in the sys_user table used to store the Workday employee_id created when the employee was hired.</td>
</tr>
</tbody>
</table>

Output variables

Table 947: Check User Exists output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>exists</td>
<td>True/false value that indicates whether or not the employee exists in the ServiceNow sys_user table.</td>
</tr>
</tbody>
</table>

Conditions

Table 948: Check User Exists conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User exists</td>
<td>This user exists in the ServiceNow instance.</td>
</tr>
<tr>
<td>User does not exist</td>
<td>This user does not exist in the ServiceNow instance, or the employee identification number is not valid.</td>
</tr>
</tbody>
</table>
### Condition Description

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure</td>
<td>The activity failed to connect to the ServiceNow instance.</td>
</tr>
</tbody>
</table>

*Create User in Users Table activity*

The Create User in Users Table activity uses the employee information returned from Workday to create a user record in the ServiceNow `sys_user` table.

When the ServiceNow instance receives a notification from Workday that a new employee has been hired, Orchestration runs a workflow called Employee On/Off Boarding to retrieve additional information about the new employee. This workflow runs an activity called Check User Exists that determines if the ServiceNow `sys_user` table already has a record for this employee. If no record exists, the Create User in Users Table activity creates one.

#### Input variables

*Table 949: Create User in Users Table input variables*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>first_name</td>
<td>First name of the employee that the activity is adding to the <code>sys_user</code> table.</td>
</tr>
<tr>
<td>last_name</td>
<td>Last name of the employee that the activity is adding to the <code>sys_user</code> table.</td>
</tr>
<tr>
<td>employee_number</td>
<td>Employee ID in the ServiceNow <code>sys_user</code> table.</td>
</tr>
<tr>
<td>user_name</td>
<td>User name in the appropriate format, such as jacinto.gawron.</td>
</tr>
<tr>
<td>email</td>
<td>New user's email address.</td>
</tr>
</tbody>
</table>

#### Output variables

*Table 950: Create User in Users Table output variables*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sys_id</td>
<td>Unique reference ID of the new employee record in the ServiceNow instance.</td>
</tr>
</tbody>
</table>

#### Conditions

*Table 951: Create User in Users Table conditions*

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User created</td>
<td>Activity successfully created the user in the ServiceNow instance.</td>
</tr>
</tbody>
</table>
Update User in Users Table activity
The Update User in Users Table activity uses the employee information returned from Workday to update an existing user record in the ServiceNow sys_user table.

When the ServiceNow instance receives a notification from Workday that a new employee has been hired, Orchestration runs a workflow called Employee On/Off Boarding to retrieve additional information about the new employee. This workflow runs an activity called Check User Exists that determines if the ServiceNow sys_user table already has a record for this employee. If a record exists, the Update User in Users Table activity updates the record, if necessary.

Input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>first_name</td>
<td>First name of the new Workday employee.</td>
</tr>
<tr>
<td>last_name</td>
<td>Last name of the new Workday employee.</td>
</tr>
<tr>
<td>employee_number</td>
<td>Employee ID in the ServiceNow sys_user table.</td>
</tr>
<tr>
<td>user_name</td>
<td>User name in the appropriate format, such as jacinto.gawron.</td>
</tr>
<tr>
<td>email</td>
<td>Email address of the new Workday employee.</td>
</tr>
</tbody>
</table>

Output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sys_id</td>
<td>Unique reference ID of the sys_user record in the ServiceNow instance.</td>
</tr>
</tbody>
</table>

Conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity updated the ServiceNow sys_user table.</td>
</tr>
<tr>
<td>Condition</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to update the ServiceNow sys_user table.</td>
</tr>
</tbody>
</table>

Global activities

Global activities are Orchestration activities created in the global scope.

Any activities you create in the global scope are listed in the Global category in the Packs and Custom tabs of the Workflow Editor.
Test Server Alive activity

The Test Server Alive activity determines if a target system is alive by its response to a particular protocol. This activity replaces an activity by the same name available in releases prior to Istanbul. If you have a workflow created in a previous version that uses the deprecated activity, your workflow will continue to work normally after upgrading to Istanbul. However, all new workflows must use the custom version of this
activity. This activity was built with the `Probe activity template`, which gives workflow administrators the ability to store input and output variables in the `databus`.

**Input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>port_probes</td>
<td>A comma separated list of protocols to use to check for signs of activity on the target machine (example: wmi,wins,https,ssh,http,https,snmp,dns)</td>
</tr>
<tr>
<td>hostname</td>
<td>Hostname or IP address of the target system to check.</td>
</tr>
</tbody>
</table>

**Output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>alive</td>
<td>Code that indicates whether or not the server is alive. If any value but '1' is returned, the server is not alive.</td>
</tr>
</tbody>
</table>

**Conditions**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Activity determined that the device is running.</td>
</tr>
<tr>
<td>Failure</td>
<td>Activity failed to determine if the target device is running. Failure could be caused by a missing protocol or a device that is not accessible.</td>
</tr>
</tbody>
</table>

**Orchestration activity designer**

The Orchestration activity designer enables a user with either the `workflow_admin` or `activity_creator` and `workflow_creator` roles to construct reusable activities that suit an organization’s business needs.

Activities created by the activity designer offer the following advantages over core activities offered in previous releases:

- Reuse `custom activities` in multiple workflows.
- Upload and download custom activities from the ServiceNow Store.
• Parse data from standard input formats.
• Test input variables against a target host or endpoint and inspect the payload.
• Automatically map values from a test payload to an activity's output variables.
• Share data between activities.
• View previous versions of an activity.

Access to the activity designer requires activation of ServiceNow Orchestration. For instructions about managing transitions and conditions for all activities, see Workflow activities on page 3367.

Orchestration provides numerous pre-defined activities, which are reusable components that can be used in numerous workflows without having to understand the complexities of the underlying system. These activities are grouped into activity packs, which address specific business needs, such as: Active Directory, Azure AD, Exchange, Infoblox DDI, and PowerShell. There are other ServiceNow applications which provide and maintain their own separate activity packs, such as Security Incident Response, Cloud Management, or Release Automation.

Customers can also build their own activities and activity packs. You can construct custom activities with a specified template through the Orchestration Activity Designer. Custom-built activities built with the Activity Designer are referred to as activity elements. Activity elements provide optimal operations, enable code reuse, and minimize the need to write code. They also enable you to follow the flow of data within a given workflow across orchestration activities. Incorporating activity elements limits the dependency on the scratchpad which reduces problems in complex workflows. Limit the use of core activities, like ‘Run Script’, unless you need direct access to the scratchpad, for example, for a counter. Activity elements do not have direct access to the scratchpad. You can, however, pass scratchpad variables as inputs into your activities.

Orchestration activities created by the activity designer:
• Can be uploaded and shared in the ServiceNow App Store
• Use the databus, which allows the activity to have well-defined inputs and outputs
• Share data across activities within a workflow
• Use versioning
• Provide a consistent approach for activity development regardless protocol

Note: Prior to the Fujirelease, activities were built with Activity Definitions. In Fuji, a new architecture was introduced using the Activity Designer. Orchestration Core activities, built originally as Activity Definitions, have been converted to use the new template format (Activity Elements) and the databus offered with the activity designer. Workflows in upgraded instances that use legacy activities continue to work normally.

For instructions on using activities to construct a workflow, see Add an activity to a workflow on page 3456.

Introduction to credentials, connections, and aliases for Orchestration

All application integrations in Orchestration require connection information, credentials, and connection and credential aliases to their respective applications to access resources.

Before you can execute an application integration in Orchestration, you must create and configure the corresponding connection information and credentials. The Connections pertains to an integration with a system, such as an IP address or endpoint with protocols. It contains specific details, such as database particulars, when integrating with a database. The associated Credentials are the authentication data required to make the connection.

Connection information and credentials can vary between QA/Development/Production environments for the same integration. The tight coupling between this data and application metadata, such as workflow or job scheduling, make application metadata obsolete when you change environments. To alleviate this problem, the concept of an alias is introduced, for connections and credentials, to decouple this data from
application metadata. These aliases allow customers to design their application metadata to couple to an alias, which during runtime resolves to connection and credential data.

There are two types of aliases, a connection and credential alias and a credential alias. There are business rules that enforce certain constraints on these aliases. Names should contain alphabets, numbers, and underscores but cannot have special characters. The alias must be unique in a scope. If you choose to have multiple active connections, you can have more than one active connection in the same domain. If you do not choose this option, you can have only one active connection in per domain.

Note: If you enable multiple active connections, when the connection records resolve, your application picks one connection based on an established order. The order of the connections depends on the API you use to retrieve connection data.

You can add additional connection attributes to an alias, which are available in connection data during runtime. Variables overridden by connection administration during runtime should not affect the alias.

The credential alias resolves only credential data. Along with alias data model, you can use a scriptable API which can get connection and credential data during runtime.

Using Connection and Credential Alias with Orchestration

Define an alias to label a credential or connection record.

The Credential and Connection Alias defines an alias that labels a credential or connection record. It is extended from the sys_metadata table. It requires the admin role. The credential_admin and connection_admin have read access to sys_alias. A connection alias contains:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the alias.</td>
</tr>
<tr>
<td>ID</td>
<td>This field is based on the format &quot;scope name.alias name&quot; Unique index on ID to ensure unique record based on scope name + name. If the scope is global, the ID is the alias name.</td>
</tr>
<tr>
<td>Type</td>
<td>You can select either 'Credential' or 'Connection and Credential'. The default is Connection and Credential.</td>
</tr>
<tr>
<td>Connection type</td>
<td>This field is applicable when the alias type is set to Connection and Credential. There are three connection types: HTTP, JDBC, JMS. The default is HTTP.</td>
</tr>
</tbody>
</table>

If you create a workday alias in global scope, the ID is set to workday

If you create a workday alias in hr app scope, the ID is set to x_hr_app.workday

- Name can only contain alphabets, numbers and underscore.
- During the upgrade, the tag in credential record will be migrated to connection alias. If the tag in previous release's credential record contains special characters other than alphabets, numbers and underscore, the tag data will be preserved during the upgrade. The user still can use these connection alias, but the user cannot update these alias, unless he removes these special characters when do the update.

Using credentials with Orchestration

Orchestration requires credentials to access resources.
Credential table

The credential table (discovery_credential) defines credentials that can be used for integration. In the previous release, the Credential table contains a string-type tag field, which labels a credential and the tag is used in orchestration activities. In the london release, we rename tag to credential alias, and change the type from string to GlideList, which is a reference to connection alias table.

Credential types

The following credential types are provided:

<table>
<thead>
<tr>
<th>Credential type</th>
<th>Description</th>
<th>Supports Test Credential option</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Applicative credentials</strong> on page 1028</td>
<td>The credentials to explore the applications on a device or computer. <em>Pattern customization</em> often need applicative credentials.</td>
<td>No</td>
</tr>
<tr>
<td><strong>Amazon Web Service credentials</strong></td>
<td>The Amazon Web Services (AWS) master account, access key ID, and secret access key.</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> You cannot test AWS credentials through the Test</td>
<td></td>
</tr>
<tr>
<td><strong>Azure Service Principal and Enterprise Agreement credentials</strong></td>
<td>The Azure service principals required for an Azure subscription.</td>
<td>No</td>
</tr>
<tr>
<td><strong>Basic authentication credentials</strong> on page 1029</td>
<td>A user name and password.</td>
<td>No</td>
</tr>
<tr>
<td><strong>CIM credentials</strong> on page 1031</td>
<td>The user name and password required to access a CIMOM - Common Information Model Object Manager (CIM) server, which obtains information about VMware ESX servers.</td>
<td>No</td>
</tr>
<tr>
<td><strong>Cloud credentials</strong> on page 1032</td>
<td>Credentials that Orchestration uses to access cloud resources.</td>
<td>No</td>
</tr>
<tr>
<td><strong>JDBC credentials</strong> on page 1037</td>
<td>A user name and password to access a Java Database Connectivity (JDBC) connection.</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>JMS credentials</strong> on page 1039</td>
<td>A user name and password to access to a Java Message Service (JMS).</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>OAuth 2.0 credentials</strong> on page 1040</td>
<td>OAuth 2.0 credentials enable ServiceNow to obtain access to user accounts on an HTTP service.</td>
<td></td>
</tr>
<tr>
<td><strong>SNMP community credentials</strong> on page 1042</td>
<td>The community string to access devices via SNMP.</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>SNMPv3 credentials</strong> on page 1044</td>
<td>The user name and keys required to access devices on your SNMP v3 network.</td>
<td>Yes</td>
</tr>
<tr>
<td>Credential type</td>
<td>Description</td>
<td>Supports Test Credential option</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td><strong>SSH credentials</strong> on page 1045</td>
<td>The user name and password to access Linux and Unix devices.</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>SSH private key credentials</strong></td>
<td>The private key credentials to access Linux and Unix devices.</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Note:</strong> For better security, SSH private key credentials are recommended over SSH password credentials.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>VMware credentials</strong> on page 1053</td>
<td>Credentials to access vCenter resources. These credentials are required for any work that is performed on vCenter, such as cloning a virtual machine.</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Windows credentials</strong> on page 1054</td>
<td>The user name and password required to access Windows computers. Several permission requirements must be met to use Windows credentials.</td>
<td>Yes</td>
</tr>
</tbody>
</table>

How MID Servers use credentials

By default, Windows MID Servers use the login credentials of the MID Server service on the host machine to discover Windows devices in the network. You should configure these service credentials so that they have domain or local administrator privileges. For Linux and UNIX machines and network devices, the MID Server uses the SSH and SNMP credentials configured in the instance in Discovery Credentials.

MID Servers that Orchestration uses must have access to the necessary credentials to execute commands on computers in the network as specified by the Workflow activities. Orchestration can use the same SSH and SNMP credentials as Discovery, but has two additional credentials designed for specific Workflow activities: Windows (for PowerShell) and VMware.

Encryption and decryption

The platform stores credentials in an encrypted field on the Credentials [discovery_credentials] table. Once they are entered, they cannot be viewed.

When credentials are requested by the MID Server, the platform decrypts the credentials using the following process:

1. The credentials are decrypted on the instance with the password2 fixed key.
2. The credentials are re-encrypted on the instance with the MID Server’s public key.
3. The credentials are encrypted on the load balancer with SSL.
4. The credentials are decrypted on the MID Server with SSL.
5. The credentials are decrypted on the MID Server with the MID Server’s private key.

**Note:** The platform does not have separate encryption keys for multi-tenant instances.
**Credential order**

Credentials can be assigned an order value in the Credentials form, which forces the application to try all the credentials at their disposal in a certain sequence. If you do not specify an order value, the application tries the credentials in the Credentials [discovery_credential] table randomly, until it finds one that works, such as when Orchestration attempts to run a command on an SSH server (such as a Linux or UNIX machine), or when Discovery attempts to query an SNMP device (such as a printer, router, or UPS).

After identifying the credentials for a device, Discovery and Orchestration create an affinity between the credentials and the device using the Credential Affinity [dscy_credentials_affinity] table. All subsequent discoveries or Orchestration activities attempt to match the credentials in this table with a device for which an affinity exists. If credentials for a device change, Discovery and Orchestration try all available credentials again until they create a new affinity.

**Note:** If Orchestration and Discovery are installed, and credential alias is enabled, multiple affinities can exist. In this case, the platform looks up credentials for each affinity and inserts the credential for the affinity with the lowest order into the probe.

Ordering credentials is useful in the following situations:

- The credentials table contains many credentials, with some used more frequently than others. For example, if the table contains 150 SSH credentials, and 5 of those are used to log into 90% of the devices, it is good practice to configure those five with low order numbers, which places them at the top of the execution list. Discovery and Orchestration will work faster if they try these common credentials first. After the first successful connection, the system knows which credentials to use the next time for each device.
- The system has aggressive login security. For example, if the Solaris database servers in the network only allow three failed login attempts before they lock out the MID Server, configure the database credentials with a low order value.

**Credential alias**

Credential alias allows flow and workflow creators to:

- Assign individual credentials to any activity in an Orchestration workflow
- Assign individual credentials to any action in Flow Designer
- Assign different credentials to each occurrence of the same activity type in an Orchestration workflow.
- Assign different credentials to each occurrence of the same action in designer flow.

Credential alias also works with credential affinities.

**External credential stores**

If you do not want credentials stored in your instance, you can use external credential repositories. External credential stores save the credentials in an external site that your instance can access. Only CyberArk is supported.

**Connections with Orchestration**

Use the connections table to setup a JMS, JDBC, or HTTP(s) connection to a target host.
Connection Table

The Connection table (sys_connection) is the base table for all connection tables. You can setup connections for the following protocols:

- JDBC
- JMS
- HTTP(s)

The connection table references the connection alias table, which couples the connection alias to connection information. Every connection records the following information:

Table 958: Base connection properties

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the connection. This field must be unique on the table.</td>
</tr>
<tr>
<td>Credential</td>
<td>Specify the credential to use with this connection. This is optional.</td>
</tr>
<tr>
<td>Connection alias</td>
<td>The connection alias resolves your connection and credentials at run time. Only one connection is active per Connection alias at any one time.</td>
</tr>
<tr>
<td>Active</td>
<td>Check to make the current connection active.</td>
</tr>
<tr>
<td>Domain</td>
<td>Domain to which the connection belongs.</td>
</tr>
</tbody>
</table>

Credential is unique across active connections, if not empty

Upgrading connection information

The JDBC connection (jdbc_connection) and JMS connection (orch_jms_ds) tables are existing Orchestration connection tables. In London, we re-parent them to extend from Connection (sys_connection) table. They move from Orchestration run time plugins to Credentials & Connections plugins. They are originally extended from sys_metadata. The sys_metadata related data will be removed. JDBC field name changes:

- JDBC server is renamed to host
- Database port is renamed to port

Create custom activities using custom activity designer templates

You can create and update different types of custom activities in the Workflow Editor using a custom template.

Roles required: workflow_admin or activity_creator

The Activity Designer contains common steps which are applicable to all the activities that you create. This procedure guides you through the common steps and the order they should be set up. You specify an activity template before you create a custom activity.

1. Navigate to Orchestration Workflow Editor.
   The Welcome tab of the Workflow Editor opens.
2. On the Custom tab in the palette, click + to create a new activity select the appropriate template from the list.

The Activity Designer form appears, with a stage indicator at the top. All new activities start at the General stage. The current stage shows with a blue underscore.

Figure 386: Activity designer stage indicator

3. Add the general properties.
   This information is standard for each custom activity, include a name, description, and other related information.

4. Create the template Create input variables on page 2000 for the template.
   Create the variables to pass into the activity in the Inputs form of the activity designer.

5. Add a pre-processing script.
   For input validation or transforming input data, you might need a pre-processing script.
6. Click Continue to open the Execution Command form, then fill out the Execution Command step based on the corresponding execution templates:
   • Create a SOAP web service activity
   • Create a JDBC activity
   • Create a JavaScript Probe activity
   • Create a PowerShell activity
   • Create a REST web service activity
   • Create a Probe activity
   • Create an SFTP activity
   • Create a Run Script activity
   • Create an SSH activity
   • Create a JMS activity

7. Test your inputs.

8. In the Outputs form, define local and/or output variables.
   Local variables can be used for temporary storage when cascading parsing rules. For example, you might extract an XML payload from within a JSON payload. A local variable can access the XML document and use that as a source for another parsing rule. The graphic shows a Local1 variable source to parse data for Output2.

![Figure 387: Define local variable](image)

9. Use one of the options to assign values to Outputs:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parsing rule</td>
<td>You can create a parsing rule and map them to the output fields by dragging and dropping the variables into the parsing rules structure. The REST, SOAP, and JDBC templates provide auto-mapping to create the parsing rules automatically. If available from the test inputs form, auto-mapping should be used when possible.</td>
</tr>
</tbody>
</table>
### Post-processing

Post-processing scripts allow you to code your own output data validation, output parsing code, and related tasks. Post-processing executes after the execution command results have been returned and before the parsing rules and conditions are run. Click Go to Post-Processing (Advanced) to create a post-processing script.

**Note:** If you create a script, this step reflects as a stage in the indicator.

---

10. Click Continue to open the *Conditions* form to create exit condition rules for your activity and then click Save.

### General properties for activity designer templates

The following General Property fields are common to all activity designer templates.

**Table 959: General Property fields common to all activity designer templates**

<table>
<thead>
<tr>
<th>Fields</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Descriptive name of the activity. Select a unique name that makes the activity easily identifiable in the palette. If you do not name the activity, it is identified in the Data tab of the Workflow Editor with an index number when it is added to a workflow. This index reflects the order in which the custom activity was added to the workflow. Only custom activities and their output variables appear in the Data tab.</td>
</tr>
<tr>
<td>Short description</td>
<td>Brief description of what the activity does.</td>
</tr>
<tr>
<td>Image</td>
<td>Icon that identifies an activity of this type in the workflow palette.</td>
</tr>
<tr>
<td>Execution template</td>
<td>Predefined template selected for this activity.</td>
</tr>
<tr>
<td>Application</td>
<td>Current <em>scope</em> set on the instance. To view the scope, click the gear icon on the right side of the title bar in any record or list and look at the value in the Application field. The activity runs in this scope within a workflow. You cannot view or change the scope for the instance in the Workflow Editor.</td>
</tr>
<tr>
<td>Accessible from</td>
<td>Accessibility setting for this activity, by scope. The following options are available:</td>
</tr>
<tr>
<td></td>
<td>• All application scopes: This activity is available to all application scopes.</td>
</tr>
<tr>
<td></td>
<td>• This application scope only: Use of this activity is restricted to the scope named in the Application field.</td>
</tr>
</tbody>
</table>
Create input variables

Create the variables to pass into the activity in the Inputs form of the activity designer.

You must name your activity in the General form before you can advance to the Inputs stage.

Roles required: workflow_admin or activity_creator

**Note:** Variable strings in the Inputs form have a 255 character limit.

1. Click the + icon to create a new input variable.
   
The designer creates a default variable called Input1.

2. Type your new variable name in the field.

3. To change the name of a variable or any of its attributes, double-click the value and then select or enter a new value in the field that appears.

4. Configure your variable using these fields:
### Table 960: Variable configuration

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Data type for this variable. Double-click on the field to display the choice list. In addition to the usual data types, you can create input arrays and encrypt individual variables that contain sensitive data. Encrypted variables are passed to the ECC Queue and then decrypted by the MID Server when they run on the target host. Sensitive data returned from running these variables on the host can then be passed to another activity through encrypted output variables.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Marks an input variable as mandatory. Variables marked as mandatory are required fields in the properties form for the activity in the workflow. The input testing feature allows you to filter on mandatory variables.</td>
</tr>
<tr>
<td>Default</td>
<td>Default value for this input variable. Default values are prepopulated for variables in the properties form for the activity in the workflow. You can override this value when you test the variables.</td>
</tr>
</tbody>
</table>

5. To reorder the variable list, select a row and then drag the row to its new location.

When you select a row to move it, the pointer icon changes to an up/down arrow icon (△).

6. To delete a variable, click the delete icon (Trash) in the row.

7. Click Continue to advance to the Execution Command stage or click Go to Pre-Processing (Advanced) to create a script that runs before the activity executes.

**Map an input variable**

After you create the input variables, map them to the fields in the Execution Command form.

Role required: activity_admin, activity_creator

These fields contain values required by the target host or endpoint to authenticate and query for data. Included in this example are fields for a command to run on the target and the MID Server to use, if one is required.

To map a variable, drag it into the appropriate field.

The designer automatically expresses the variable in the syntax the system requires.
Configure the PowerShell execution command

Use the input variables you created to configure the command that Orchestration executes on the Windows target machine.

Create the input variables you need in the Inputs form before you can advance to the Execution Command stage.

Role required: activity_creator, admin

**Note:** You can test the PowerShell connection between the MID Server and the target computer without having to run the activity in a workflow context. For details, see *test template outputs*.

1. Drag variables from the list of inputs and drop them into command fields.
The system formats the variable in the proper syntax for the command.
Figure 388: PowerShell execution command

2. Complete the fields shown in the table.

Table 961: Powershell command fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>Input variable builder. Create variables to map to available fields.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Target host</td>
<td>Host name or IP address of the target server for this PowerShell activity.</td>
</tr>
<tr>
<td>Script type</td>
<td>Type of script to run on the PowerShell host. Available options are:</td>
</tr>
<tr>
<td></td>
<td>• Custom Powershell command</td>
</tr>
<tr>
<td></td>
<td>• MID Server script file</td>
</tr>
<tr>
<td>MID Server script file</td>
<td>MID Server script file to run. This field is available when the Script type</td>
</tr>
<tr>
<td>Command</td>
<td>Command that this activity runs on the target host. This field is available</td>
</tr>
<tr>
<td></td>
<td>when the Script type selected is Custom Powershell command. You can drag</td>
</tr>
<tr>
<td></td>
<td>and drop input variables from the variable builder into this field to</td>
</tr>
<tr>
<td></td>
<td>create your command.</td>
</tr>
<tr>
<td>Powershell variables</td>
<td>Name-value pairs to pass to the host with Powershell. You can create these</td>
</tr>
<tr>
<td></td>
<td>variables manually, or drag input variables into the Value field.</td>
</tr>
<tr>
<td></td>
<td>Encrypted input variables retain their encryption, regardless of the data</td>
</tr>
<tr>
<td></td>
<td>type settings in this field. If you type in a value and select the</td>
</tr>
<tr>
<td></td>
<td>Encrypted data type, your value appears in plain text in this field and</td>
</tr>
<tr>
<td></td>
<td>is only encrypted when it passes to the ECC Queue.</td>
</tr>
<tr>
<td>Use MID service account</td>
<td>Forces this activity to authenticate on the target host using the credentials</td>
</tr>
<tr>
<td></td>
<td>of the MID Server service account only, without trying any other</td>
</tr>
<tr>
<td></td>
<td>credentials. When this check box is selected, the Credential tag field is</td>
</tr>
<tr>
<td></td>
<td>not available.</td>
</tr>
<tr>
<td>Credential tag</td>
<td>Specific credential alias this activity must use to run Powershell commands</td>
</tr>
<tr>
<td></td>
<td>on the host. If this field is left blank, the MID Server tries all the</td>
</tr>
<tr>
<td></td>
<td>available credentials until it finds a valid one, ending with the MID</td>
</tr>
<tr>
<td></td>
<td>Server service account. If a credential alias is defined, the MID Server</td>
</tr>
<tr>
<td></td>
<td>tries the credentials for that alias only and does not try the MID Server</td>
</tr>
<tr>
<td></td>
<td>service account. This field is not available when the Use MID service</td>
</tr>
<tr>
<td></td>
<td>account check box is selected.</td>
</tr>
<tr>
<td>Required MID Server capabilities</td>
<td>MID Server to use for querying Powershell, by capabilities. By default, the</td>
</tr>
<tr>
<td></td>
<td>system selects a Powershell MID Server.</td>
</tr>
</tbody>
</table>

3. Click Save.
4. Click Continue to advance to the Outputs stage.

Test activity template inputs
You can test the input parameters of a custom activity during its development without having to run the activity in a workflow context.

Create input variables and map them to fields in the Execution Command form or provide actual values for these fields.

Role required: web_service_admin, activity_admin, activity_creator

An input test executes only the input parameters against an endpoint and not the pre-processing or post-processing scripts. You need to use a workflow to test a pre-processing or post-processing script. You do not need to check out the activity to test it, and you can test input variables from any stage in the activity designer, if your activity is properly configured. Typically, the Execution Command stage is the point at which your inputs are ready for testing.

Note: If you intend to use auto-mapping, you must test your input variables.

1. Click Test Inputs.

The list of input source variables appears. If you added default values for these variables, those values appear in the Substitute Value column. Mandatory variables are marked with a red star. In this example, a SOAP endpoint returns a value for a stock quote variable.

![Image: Fill in your test values](image)

2. Filter the variable list with these controls:
   - All Inputs: Displays all input variables. This is the default view.
   - Mandatory Inputs: Displays only mandatory input variables.
   - Inputs Without Defaults: Shows input variables that do not have assigned default values.

3. Reset values as needed.
   - Reset default values: Replaces any test values set in this form with the default values, if they are present.
   - Clear values: Clears all values in the input variable list, even if default values exist.
4. When your test values are configured correctly, click OK. The system runs the values for all the inputs configured against the specified target and returns the resulting payload. The buttons in the Response form display different views of the payload. The entire payload appears in the Raw Output window.

```json
{
    "status_code": 200,
    "body": "<?xml version="1.0" encoding="utf-8"?>
<soap:Envelope xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/
<soap:Body>
<GetQuoteResponse xmlns="http://www.webserviceX.NET/">
   <GetQuoteResult>
   <StockQuotes>&lt;Stock&gt; &lt;Symbol&gt;NOM&lt;/Symbol&gt; &lt;Last&gt;78.92&lt;/Last&gt; &lt;Date&gt;7/16/2015&lt;/Date&gt; &lt;Time&gt;4:05pm&lt;/Time&gt; &lt;Change&gt;1.34&lt;/Change&gt; &lt;Open&gt;78.15&lt;/Open&gt; &lt;High&gt;79.15&lt;/High&gt; &lt;Low&gt;77.83&lt;/Low&gt; &lt;Volume&gt;865406&lt;/Volume&gt; &lt;MarketCap&gt;12.1486&lt;/MarketCap&gt; &lt;PreviousClose&gt;77.58&lt;/PreviousClose&gt; &lt;PercentageChange&gt;1.7347&lt;/PercentageChange&gt; &lt;AnnRange&gt;54.85 - 83.52&lt;/AnnRange&gt; &lt;Earnings&gt;-1.31&lt;/Earnings&gt; &lt;EarningsPerShare&gt;&lt;/EarningsPerShare&gt; &lt;Name&gt;ServiceNow&lt;/Name&gt; &lt;Stock&gt; &lt;GetQuoteResponse &gt; &lt;/GetQuoteResponse &gt; &lt;/Stock&gt; &lt;/GetQuoteResponse &gt; &lt;/Stock&gt; &lt;/GetQuoteResponse &gt; &lt;/GetQuoteResponse &gt; &lt;/soap:Body&gt;
</GetQuoteResult>
</GetQuoteResponse>
</soap:Body>
</soap:Envelope>

"error": null,
"header": {
    "X-AspNet-Version": "4.0.30319",
    "Date": "Thu, 16 Jul 2015 23:25:01 GMT",
    "Content-Length": "979",
    "Content-Type": "text/xml; charset=utf-8",
    "Server": "Microsoft-IIS/7.0",
    "X-Powered-By": "ASP.NET"
    "Cache-Control": "private, max-age=0"
}
```
5. To map appropriate parameter values in the payload to variables in the Outputs stage automatically, select an *auto-mapping option.*

6. Alternately, you can click Save for parsing rules to copy the entire payload to the parsing rules. This allows you to manually select values for the output variables directly from the payload. This action completely overwrites any previous payload that existed in the parsing rules.

7. Click the X in the upper right corner of the window to close it.

**Data encryption for activity variables**

You can protect sensitive data passed from Orchestration activities by encrypting input and output variables.

The system never stores encrypted variables as clear text. If the MID Server is used to fulfill the activity, the corresponding ECC Queue’s input payload is encrypted if an *encrypted output variable* is defined in the template. Output variables passed to a downstream activity as input variables maintain their encryption throughout processing.

Inputs that require data encryption come from one of these sources:

- Workflows: These inputs are provided through the Workflow Editor and must be in the password2 format for two-way encryption.
- Service catalog requests: These input values are provided to an activity as encrypted variables from a service catalog item.
- GlideRecord: These are variables attached to any ServiceNow table. The source column in the table must be a password2 type variable.
- Activity outputs: These are variables passed as outputs from one activity to a downstream activity as inputs, through the data bus.
- Empty string: The system allows you to define encrypted input variables but never pass a value into the variable.

**Activity designer template pre-processing fields**

Use the Pre Processing form of the activity designer to define a script to run before the activity executes.

**Pre-processing fields**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input process script</td>
<td>Script to run before the activity executes.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Variables</td>
<td>Input variables that are available to use as building blocks in the input process script. Click the arrow above the field to open the variables list. Click an item in the tree to add it to your script in the appropriate syntax. The list displays execution parameters and input variables you passed into the activity on the Inputs form. All activity variables added in the Inputs form are read-only and are expressed in the pre-processing script with this syntax: activityInput.variable. Before the activity executes and makes a call to the service or host, you can override the effective execution value of this variable by assigning values to the executionParam.variable_name execution parameter. Refer to the specific execution parameters for your template.</td>
</tr>
</tbody>
</table>

**Logging**

Activity designers can add logging to the pre-processing using the ActivityLogger API, which works for scoped or global applications. Logged data from the script appears in the Workflow Log related list in the context records for any workflow that uses the activity. The Source for these messages in the workflow log is ACTIVITY.

**Important:** To display the debug messages in the workflow log, set the glide.workflow.log.debug property to true.

The supported messages are:

- ActivityLogger.debug("Pre Processing Log Message");
- ActivityLogger.info("Pre Processing Log Message");
- ActivityLogger.warn("Pre Processing Log Message");
- ActivityLogger.error("Pre Processing Log Message");
Template post-processing fields

From the Post Processing form in the activity designer you can define a script to run after the activity executes.

**Post-processing fields**

To use the results returned by the activity, append the `executionResult.` prefix to these parameters.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output process script</td>
<td>Script to run after the activity executes.</td>
</tr>
<tr>
<td>Variables</td>
<td>Input variables that are available to use as building blocks in the output process script. Click the arrow above the field to open the variables list. Click an item in the tree to add it to your script in the appropriate syntax. The list displays execution results and the variables you passed into the activity on the Inputs form. All activity variables added in the Inputs form are read-only and are expressed in the post-processing script with this syntax: <code>activityInput.variable</code>. For parameter descriptions, refer to the table in the post-processing parameters topic for this activity.</td>
</tr>
</tbody>
</table>

**Logging**

Activity designers can add logging to the post-processing script using the `ActivityLogger` API, which works for scoped or global applications. Logged data from the script appears in the Workflow Log related list in
the context records for any workflow that uses the activity. The Source for these messages in the workflow log is ACTIVITY.

**Important:** To display the debug messages in the workflow log, set the glide.workflow.log.debug property to true.

The supported messages are:

- `ActivityLogger.debug("Post Processing Log Message");`
- `ActivityLogger.info ("Post Processing Log Message");`
- `ActivityLogger.warn ("Post Processing Log Message");`
- `ActivityLogger.error("Post Processing Log Message");`

![ActivityLogger API](image)

**Figure 391: ActivityLogger API**

**Auto-map activity output variables**

You can map parameter values in a test payload to variables in the Outputs tab automatically.

Role required: admin

1. From the Execution Command in the template, select the Inputs tab.
2. Click Test Inputs to test the input parameters.
   - If you added actual values for the parameters and fields, the system runs those values against the specified target and returns the resulting payload. If you mapped input variables to fields and parameters, the system displays a dialog box for assigning test values to those variables.
3. Provide test values, if requested, and click OK to display the payload.
   - The entire payload appears in the Raw Output tab of the Response form.
4. Select an auto-mapping option:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
</table>
| Auto-Map to Local | Translates the entire payload into a JSON object and places it in the data bus. This allows for post-processing manipulation in JavaScript. This selection causes the entire data field on the right to disappear and the inputs structure to be auto-populated with these default variables:  
  - output  
  - totalRows  
  - errorMessage  
  - eccSysId                                                                                                                                     |
| Auto-Map to Output| Automatically populates the output variables in the activity with the same default variables used as inputs for the local variable.                                                                           |

*Note:* No parsing rules are available with auto-mapping selections.

Create an output variable

The Outputs form in the designer contains a variable builder for creating data structures of objects and arrays.

Roles required: activity_admin, activity_creator

Elements in this structure are mapped with Create a parsing rule on page 2014 to specific data contained in payloads returned from an endpoint or host. These variables and their values are then made available locally or for reuse in other activities.

1. Click the + icon in the Outputs column to create a local or output variable.
   
   Local variables are only available within an activity and are not visible in the data structures displayed in the Custom tab. Output variables are available for reuse in other activities, either individually or as an entire data structure. When you create a new variable of either type, the designer provides a default name of Local1 or Output1.

2. Type your new variable name in the field and select a data type.

   Variable names must be unique within an array or an object. You can assign a data type of Encrypted to output variables that contain sensitive data. Data protected by encryption is passed to other activities or processes encrypted and is never displayed in plain text.
3. To change the name of a variable or any of its attributes, double-click the value, type a new value in the editing field, and then press Enter. The icon to the left of the name reflects the data type of the variable.

4. To reorder the variable list, select a row and then drag the row to its new location. When you select a row to move it, the pointer icon changes to an up/down arrow icon.

5. Drag and drop the row into another location.

6. To reuse a variable from another activity, drag it from the Custom tab in the palette and drop it onto the Local or Output heading at the top of the variable list. To copy an entire data structure, drag the parent object or array into the variable list header. The designer duplicates the copied data structure in the outputs variable builder.

Figure 392: Reuse of data structures
7. To delete a variable, click the delete icon in the row.

Activity designer template outputs
Output variables contain messages returned from a destination that are available to other activities in a workflow or internally to the activity.

Table 962: Activity designer output fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable name</td>
<td>Name of a variable, either Local or Output, that this activity passes.</td>
</tr>
<tr>
<td>Local</td>
<td>Variable that contains a value used within an activity. For example, use a local variable to identify metadata that is processed within an activity before the final value is exported to an output variable.</td>
</tr>
<tr>
<td>Output</td>
<td>Variable that contains a value that is passed to other activities in the workflow.</td>
</tr>
</tbody>
</table>

Map an output field
Mapping is configured with parsing rules that allow you to build expressions in the appropriate data format for the selected payload.

Role required: activity_admin, activity_creator

When you are finished creating the output data structure, map each variable to the specific data you want to extract from the target host.

To map a variable, drag it from the Outputs variable builder and drop it into an empty Variable name field in the Parsing rules section.

See create a parsing rule for instructions on configuring parsing for output variables.
Create a parsing rule

Populate output variables defined in a custom activity with payload data returned from an inputs test on an external host or endpoint.

Roles required: activity_admin, activity_creator

1. Navigate to Workflow Workflow Editor.
2. From the Custom tab in the palette, open a custom activity.
3. In the Activity Designer form, advance to the Output stage.
4. Drag an output variable from the data structure builder into the Variable name field in the Parsing rules builder.
Figure 393: Mapping variables to parsing rules

The parsing rules form appears for the selected variable. By default, the parsing type is set to Direct, which populates the variable with all the data from the selected payload, without parsing the contents. Each template has a specific default parsing source.

5. Complete the form using the fields in the table.
   In this example, the parsing type selected is XML, which allows you to select specific parameters from the payload to parse.
### Parsing rule for localBody

<table>
<thead>
<tr>
<th>Parsing source</th>
<th>Variable Name</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>executionResult.body</code></td>
<td><code>activityLocal.localBody</code></td>
</tr>
</tbody>
</table>

**Expression**

```
$age
```

**Sample payload data**

```xml
<xml version="1.0"?>
<data>
  <user>
    <user>
      <name>user one</name>
      <age>42</age>
    </user>
    <user>
      <name>user two</name>
      <age>27</age>
    </user>
    <user>
      <name>user three</name>
    </user>
  </user>
</data>
```

**Parsing result**

27
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parsing source</td>
<td>Source of the data returned from the target host or endpoint. Each template opens to a specific, default payload. Available choices depend on the execution template selected for the activity. You can also use local variables as a parsing source if a parsing rule has previously been defined for them. For a list of the available payloads for each template, see <a href="#">Activity designer parsing sources</a> on page 2018.</td>
</tr>
<tr>
<td>Expression</td>
<td>Expression used to extract specific data from the selected parsing source. This expression is created from clickable data in the sample payload and appears in the format selected in the Parsing type field. When testing, the expression can return multiple results. Discern which choice gives reliable or predictable results before choosing your expression.</td>
</tr>
<tr>
<td>Note</td>
<td>The system cannot generate clickable RegEx expressions from sample data. You must write all regular expressions manually.</td>
</tr>
<tr>
<td>Variable name</td>
<td>Revised variable name as it is used in the final output expression. The system adds the activityOutput or activityLocal prefix to the variable you specify.</td>
</tr>
<tr>
<td>Parsing type</td>
<td>The language to use for querying the target host's payload. The selections are:</td>
</tr>
<tr>
<td></td>
<td>• Direct: Maps to the entire content of the payload selected in the Parsing source field, without any parsing. This is the default parsing type.</td>
</tr>
<tr>
<td></td>
<td>• XML: XPath query used for selecting nodes from an XML payload.</td>
</tr>
<tr>
<td></td>
<td>• JSON: JSONPath query for selecting parts of a JSON payload.</td>
</tr>
<tr>
<td></td>
<td>• RegEx: Parsing method that uses a regular expression to extract data from a payload. The RegEx parsing type does not support multi-line parsing and is not case sensitive.</td>
</tr>
<tr>
<td>Short description</td>
<td>Brief description of this parsing rule.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Sample payload data</td>
<td>Sample data from the source containing the data requested. This field is not available for Direct parsing types. After you click Parse sample data, the data in this field cannot be edited, but becomes clickable for the purpose of creating expressions. Click Edit sample data to make the field editable again.</td>
</tr>
<tr>
<td>Parsing results</td>
<td>Displays the data returned from the source by the selected expression. This field is not available for Direct parsing types.</td>
</tr>
</tbody>
</table>

6. To retest the inputs, click Get sample payload from test. This action reopens the test form, allowing you to substitute different test values and create a different payload.

7. Click Save to have the parsing rules overwrite the previous payload with the one you just created.

8. To create an expression for the parsing rule, click the specific parameter you want to see in the sample payload.

   The value for that parameter appears in the Parsing result field, and the system creates the appropriate expression in the Expression field.

9. Click Submit to save the parsing rule for that variable.

### Activity designer parsing sources
This table lists the parsing sources available with each execution template.

<table>
<thead>
<tr>
<th>Template</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOAP Web Service</td>
<td>• executionResult.body (Default)</td>
</tr>
<tr>
<td></td>
<td>• executionResult.status_code</td>
</tr>
<tr>
<td></td>
<td>• executionResult.header</td>
</tr>
<tr>
<td></td>
<td>• executionResult.error</td>
</tr>
<tr>
<td>JDBC</td>
<td>• executionResult.output (Default)</td>
</tr>
<tr>
<td></td>
<td>• executionResult.errorMessages</td>
</tr>
<tr>
<td></td>
<td>• executionResult.probeCompletedEccId</td>
</tr>
<tr>
<td></td>
<td>• executionResult.totalRows</td>
</tr>
<tr>
<td>JavaScript Probe</td>
<td>• executionResult.payload (Default)</td>
</tr>
<tr>
<td></td>
<td>• executionResult.output</td>
</tr>
<tr>
<td></td>
<td>• executionResult.eccSysId</td>
</tr>
<tr>
<td></td>
<td>• executionResult.errorMessages</td>
</tr>
<tr>
<td>Template</td>
<td>Source</td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Powershell        | • executionResult.output (Default)  
                       • executionResult.tags  
                       • executionResult.hresult  
                       • executionResult.eccSysId  
                       • executionResult.errorMessages |
| REST Web Service  | • executionResult.body (Default)  
                       • executionResult.status_code  
                       • executionResult.header  
                       • executionResult.error         |
| SFTP              | • executionResult.output (Default)  
                       • executionResult.eccSysId  
                       • executionResult.errorMessages  
                       • executionResult.tags                |
| Probe             | • executionResult.output (Default)  
                       • executionResult.payload  
                       • executionResult.eccSysId       |
| SSH               | • executionResult.output (Default)  
                       • executionResult.eccSysId  
                       • executionResult.errorMessages  
                       • executionResult.tags                |
| JMS               | • executionResult.status  
                       • executionResult.standardHeaders  
                       • executionResult.customHeaders  
                       • executionResult.messagePayload  
                       • executionResult.eccSysId  
                       • executionResult.errorMessages |

**Activity designer parsing rule example**

In this example, the parsing rule is configured to populate the activityOutput.ipv4 variable with the value for the IP address from a domain server, using PowerShell.

Role required: activity_creator, activity_admin

To generate the sample data, the administrator must actually run the command on the host and then paste the data returned into the Sample payload data field when creating the parsing rule. The administrator can then create an expression that returns IP addresses from that sample in two formats: ipv4 and ipv6. In this example, the system produces two expressions to use for the parsing rule.

1. Navigate to Workflow Workflow Editor and open the activity that runs on the host.
2. Click the Inputs tab, and note the Command.
3. In a PowerShell console, run the Command on the host to extract the XML sample that contains the values you need.

4. Copy the data that is returned to the clipboard.

5. In the activity designer, click the Outputs tab and paste the returned data into the Sample payload data field.
   In this example, the data includes IP addresses in two different formats and the domain name.

6. Select the parsing type for the source. In this example, select XML.
7. **Click Parse sample data.**

The system displays the XML in the proper format, and it becomes *clickable*. In this view, the system can translate clicked data from the sample into an expression.
8. To create the expression, click the elements in the data sample you want to map to the variable. Based on the sample data you clicked, the system creates two expressions.
9. Select an expression from the list.

The desired result is the IP address that has a type attribute of ipv4. The system populates the Expression field with this choice.
10. Click Test expression.

The system parses the payload using the selected expression and returns the requested data in the Parsing result field.
11. Click Submit.

The view returns to the Outputs tab of the activity designer. The new parsing rule is listed, and a blank row is available for another rule.
Activity conditions

Create the exit conditions for your activity in the Condition column and set the order for each.

The system evaluates the condition with the lowest order number first and stops when it finds the first true condition. The system delays evaluation of conditions with an Else value set to true until all conditions with an Else value set to false are evaluated. If the system does not find a true condition, it looks for a default condition in which the value for Else is true and takes this exit. You must have at least one default exit condition, or the activity hangs when the workflow runs.

The following are possible conditions you might create for an activity:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Tests for a success condition. Else is set to false and the Order is set to 100. If this condition is true, the activity takes the Success exit. If this condition is false, the system evaluates the next condition in order.</td>
</tr>
<tr>
<td>Retry</td>
<td>Tests for a condition that runs the activity again. Else is set to false. If this condition is true, the activity runs again. If this condition is false, the system takes the default Failure exit.</td>
</tr>
<tr>
<td>Failure</td>
<td>Default condition that allows the workflow to continue if the other conditions in the activity are false. Else is set to true.</td>
</tr>
</tbody>
</table>
Orchestration custom activity templates

Orchestration provides customizable activity templates to create and manage custom activities in the Workflow Editor.

You create and update different types of Orchestration activities with the Activity Designer using activity templates for SSH, PowerShell, REST, SOAP, JMS, SFTP, JDBC, JavaScript Probes, and Probes.

Hundreds of workflows can share these activities simultaneously. Before you change an activity, you should check the workflows that they are part of by clicking the form menu icon and selecting Used In. Any central change to a versioned activity automatically updates across workflows unless you have pinned that activity.

All the Orchestration Core activities are built using the Activity Designer in scoped applications. Custom activities can be developed in the global scope or their own application scope even if that scope is different from the scope of the workflow. Use Activity scoping on page 2098 when build your own activity packs.

Create a JDBC activity

Create a custom JDBC activity to automate SQL commands and stored procedure calls to relational databases from workflow.

Role required: activity_admin, activity_creator

The JDBC activity template allows you to execute ANSI SQL statements or stored procedures on a target database. Support for stored procedures with IN, OUT, and INOUT parameters are available in London. To learn how to set up these parameters, see JDBC stored procedure parameters on page 2033.

**Note:** If you are transferring bulk data into a ServiceNow instance from an external data source, use Import sets. The JDBC activities allow you to transfer data between external data sources and ServiceNow within a workflow. It is not intended to replace the bulk import features of data sources.

1. Create or verify your JDBC credential.
Your JDBC credentials must have permission for the target database and proper configuration for the corresponding JDBC connection. Credentials must be set up before you can create a JDBC activity.

2. Create or verify your **JDBC connection**.
   Your JDBC connection must be configured with valid JDBC credentials set up before you can create a JDBC activity.

3. Create a **custom activity**.
   This action creates a custom activity using a template.

4. After setting up **general properties** and **creating input variables**, configure the JDBC Execution Command:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>JDBC Connection</strong></td>
<td>Configure or reference the appropriate JDBC Connection for the database. The connection selected provides the activity with the following information:</td>
</tr>
<tr>
<td></td>
<td>• Target database information (server and database names)</td>
</tr>
<tr>
<td></td>
<td>• Connection URL</td>
</tr>
<tr>
<td></td>
<td>• Target database port (if different from standard port number)</td>
</tr>
<tr>
<td></td>
<td>• Database instance name</td>
</tr>
<tr>
<td><strong>Credential</strong></td>
<td>JDBC credential to use for your JDBC connection.</td>
</tr>
<tr>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>SQL statement</td>
<td>Input the ANSI SQL to execute on the JDBC target database.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This field is hidden when the Stored Procedure check box is selected.</td>
</tr>
<tr>
<td></td>
<td>You can map the input variables you created to configure the SQL statements. By default, you can run the following SQL statements.</td>
</tr>
<tr>
<td></td>
<td>• select</td>
</tr>
<tr>
<td></td>
<td>• insert</td>
</tr>
<tr>
<td></td>
<td>• update</td>
</tr>
<tr>
<td></td>
<td>• delete</td>
</tr>
<tr>
<td></td>
<td>• show</td>
</tr>
<tr>
<td></td>
<td>• create</td>
</tr>
<tr>
<td></td>
<td>• describe</td>
</tr>
<tr>
<td></td>
<td>For added security measure, a MID Server property controls the operations that this JDBCOrchestrationProbe executes, which restricts the SQL commands used. This property protects against potentially destructive commands, such as drop database. The mid.property.jdbc_operations contains the MID Server property controls.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> You cannot run multiple statements of different types. For example, you cannot run a select statement and an update statement together, but you can run two insert statements. However, you cannot run multiple select statements in this activity.</td>
</tr>
<tr>
<td>Maximum rows</td>
<td>Maximum number of records to retrieve from database. The default is 1000.</td>
</tr>
<tr>
<td>Maximum payload size (KB)</td>
<td>You can set a limit on the maximum payload size of data retrieved from the database. The default is 64 kilobytes.</td>
</tr>
<tr>
<td>Connection timeout</td>
<td>How long the activity waits to make the connection. This field is populated automatically from the data source, but can be changed for this activity.</td>
</tr>
<tr>
<td>Query timeout</td>
<td>Elapsed time to wait after running the query until the data is returned. This field is populated automatically from the data source, but can be changed for this activity.</td>
</tr>
<tr>
<td>Required MID Server capabilities</td>
<td>MID Server to use for querying JDBC, by capabilities. By default, the system selects a MID Server that has JDBC capability.</td>
</tr>
</tbody>
</table>
Option | Description
---|---
Use stored procedure | If checked, you can run a stored procedure on MySQL, Oracle, or SQL Server databases by entering the procedure name and parameters. See JDBC stored procedure parameters on page 2033.

Note: You can map parameter values in a test payload to variables in the Outputs tab automatically. See automap output variables.

- Test JDBC activity inputs
- Use auto-mapping to generate outputs and parsing rules (recommended for JDBC)
- If you do not use auto-mapping, you can manually create output variables and create parsing rules

Create a JDBC connection for an Orchestration activity
The JDBC Connection [jdbc_connection] table provides the information custom JDBC Orchestration activities use to connect to various target databases.

You must have an appropriate JAR file, whether it is supplied with the instance or a custom JAR file.

Note: The ServiceNow instance supplies mysql-connector-java-5.1.21.jar, sql-server-jdbc-4.0.jar, and ojdbc6.jar files as part of the current release, which supports MySQL, SQLServer, and Oracle databases. Other databases, such as Sybase or DB2 Universal, must use a custom JAR file that must be uploaded to the instance before setting the JDBC connection.

Role required: activity_admin, activity_creator

JDBC credentials are retrieved separately by the activity designer template and support external credential storage, such as CyberArk.

1. Navigate to Orchestration Credentials & Connections JDBC Connections and click New.
2. Complete the form using the fields in the table.
   The database selection in the Format field determines which fields are available.

Table 966: JDBC connection fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Database Format</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>All</td>
<td>Unique name of this JDBC connection. For example, you might enter JDBC MySQLProd.</td>
</tr>
<tr>
<td>Query timeout</td>
<td>All</td>
<td>Maximum elapsed time the JDBC query is allowed to run without a response.</td>
</tr>
<tr>
<td>Connection timeout</td>
<td>All</td>
<td>Maximum elapsed time for the JDBC activity to wait while attempting to connect to the target database.</td>
</tr>
<tr>
<td>Application</td>
<td>All</td>
<td>Scope for this table. By default, the JDBC Connection [jdbc_connection] table runs in the Global scope.</td>
</tr>
<tr>
<td>Domain</td>
<td>All</td>
<td>Domain for this table. By default, the JDBC Connection [jdbc_connection] table runs in the global domain.</td>
</tr>
<tr>
<td>Field</td>
<td>Database Format</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Format</td>
<td>All</td>
<td>Database type for this connection. The default choices are:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• MySQL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Oracle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• SQLServer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>You can add Sybase or DB2 Universal to the choice list by uploading the appropriate JDBC driver JAR file to the instance. Orchestration automatically recognizes these drivers when they are loaded into the system and adds them to this list.</td>
</tr>
<tr>
<td>Server</td>
<td>Oracle, MySQL, SQLServer</td>
<td>Host name or IP address of the database server.</td>
</tr>
<tr>
<td>Oracle sid</td>
<td>Oracle</td>
<td>The Oracle database site identifier. The default value is orcl.</td>
</tr>
<tr>
<td>Oracle port</td>
<td>Oracle</td>
<td>Port that the Oracle database is using. The default value is 1521.</td>
</tr>
<tr>
<td>Database name</td>
<td>MySQL, SQLServer</td>
<td>Name of the database.</td>
</tr>
<tr>
<td>Database port</td>
<td>MySQL, SQLServer</td>
<td>Port that the selected database is using.</td>
</tr>
<tr>
<td>Instance name</td>
<td>SQLServer</td>
<td>Instance name for the selected SQLServer</td>
</tr>
<tr>
<td>Connection URL</td>
<td>All</td>
<td>URL that the MID Server uses to connect to the specified database. The URL is created automatically when you save the form, and is read-only for the default databases.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> If the format selected is not one of the default databases, you must create the connection URL manually so that the MID Server knows how to create the connection.</td>
</tr>
<tr>
<td>JDBC driver</td>
<td>None, DB2 Universal, Sybase</td>
<td>The JDBC driver to use for this connection when it is not a default database.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> If you add a Sybase or DB2 Universal database, you must enter the driver name in this field and upload the driver JAR file to the instance.</td>
</tr>
</tbody>
</table>
3. Click Submit.

**Auto-map JDBC activity output variables**

The ServiceNow activity designer allows you to map parameter values in a JDBC test payload to variables in the Outputs tab automatically.

Role required: admin

1. In the JDBC provider template form, select the Inputs tab.
2. Click Test Activity to test the input parameters.
   - If you added actual values for the parameters and fields, the system runs those values against the specified target and returns the resulting payload. If you mapped input variables to fields and parameters, the system displays a dialog box for assigning test values to those variables.
3. Provide test values, if requested, and click OK to display the payload.
The entire payload appears in the Raw Output tab of the Response form.

4. Select one of these auto-mapping options.
   - Auto-Map to Local: Directly maps values to a local variable for use within the activity.
   - Auto-Map to Output: Directly maps values to the output variable to pass to other activities in the workflow. Auto-mapping to an output variable creates an array of objects, each of which contains the column names from the query result.

**JDBC stored procedure parameters**
You can use Orchestration to run a stored procedure on MySQL, Oracle DB, and MS-SQL databases. There is support of multiple data types, with the following limitations:

- Only one result-set is returned.
- The order of input and output data types in the stored procedure parameters must match the activity definition.
- Binary, Blob, Varbinary, and LongBinary should be base64 encoded.
- Date, Time, and Timestamp have a specific format:

  **Date format:** `yyyy-mm-dd`  
  `yyyy-mm-dd` is the supported format.

  **Time format:** `hh:mm:ss[.sss]`  
  `hh:mm:ss[.sss]` is the supported format. Precision is in milliseconds only, microseconds or nanoseconds cannot be handled.
  
  **Note:** 10:30:59 and 10:30:59.999000 are correct but 10:30:59. is incorrect.

  **Timestamp format:** `yyyy-mm-dd hh:mm:ss[.ffffff]`  
  `yyyy-mm-dd hh:mm:ss[.ffffff]` is the supported format. Precision is to microseconds.

  - ResultSet is the first result set coming back from database server.
  - MS-SQL does not support INOUT parameters. If you use INOUT parameters, the Activity Template transparently maps them to OUT parameters.

  **Note:** If you do not want to do a validation of data types in stored procedure parameters, like the legacy behavior, you set the glide.stored_proc.data_type.validation as false. See [MID Server properties](https:// servicenow. com) for more information.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode</td>
<td>Type of stored procedure parameter. Supported parameters:</td>
</tr>
<tr>
<td></td>
<td>• IN</td>
</tr>
<tr>
<td></td>
<td>• OUT</td>
</tr>
<tr>
<td></td>
<td>• INOUT</td>
</tr>
<tr>
<td>Sql Type</td>
<td>A SQL data type. Supported data types:</td>
</tr>
<tr>
<td></td>
<td>• ARRAY</td>
</tr>
<tr>
<td></td>
<td>• BIGINT</td>
</tr>
<tr>
<td></td>
<td>• BINARY</td>
</tr>
<tr>
<td></td>
<td>• BIT</td>
</tr>
<tr>
<td></td>
<td>• BLOB</td>
</tr>
<tr>
<td></td>
<td>• CHAR</td>
</tr>
<tr>
<td></td>
<td>• CLOB</td>
</tr>
<tr>
<td></td>
<td>• DATE</td>
</tr>
<tr>
<td></td>
<td>• DECIMAL</td>
</tr>
<tr>
<td></td>
<td>• DISTINCT</td>
</tr>
<tr>
<td></td>
<td>• DOUBLE</td>
</tr>
<tr>
<td></td>
<td>• FLOAT</td>
</tr>
<tr>
<td></td>
<td>• INT</td>
</tr>
<tr>
<td></td>
<td>• INTEGER</td>
</tr>
<tr>
<td></td>
<td>• JAVA_OBJECT</td>
</tr>
<tr>
<td></td>
<td>• LONGVARBINARY</td>
</tr>
<tr>
<td></td>
<td>• LONGVARCHAR</td>
</tr>
<tr>
<td></td>
<td>• NULL</td>
</tr>
<tr>
<td></td>
<td>• NUMERIC</td>
</tr>
<tr>
<td></td>
<td>• OTHER</td>
</tr>
<tr>
<td></td>
<td>• REAL</td>
</tr>
<tr>
<td></td>
<td>• REF</td>
</tr>
<tr>
<td></td>
<td>• REF_CURSOR</td>
</tr>
<tr>
<td></td>
<td>• SMALLINT</td>
</tr>
<tr>
<td></td>
<td>• STRUCT</td>
</tr>
<tr>
<td></td>
<td>• TIME</td>
</tr>
<tr>
<td></td>
<td>• TIMESTAMP</td>
</tr>
<tr>
<td></td>
<td>• TINYINT</td>
</tr>
<tr>
<td></td>
<td>• VARBINARY</td>
</tr>
<tr>
<td></td>
<td>• VARCHAR</td>
</tr>
<tr>
<td>Name/Value</td>
<td>Name-value pairs to pass to the host. You can create these parameters manually, or drag and drop input variables into the parameter fields and assign a value.</td>
</tr>
</tbody>
</table>

**Note:** Not all database providers support the entire realm of JDBC data types. Reference your database reference manual to understand the supported datatypes for your installation.
**Test JDBC activity template inputs**

You can test the input parameters of a custom JDBC activity during its development without having to run the activity in a workflow context.

Create input variables and map them to fields in the Execution Command form or provide actual values for these fields. Role required: web_service_admin, activity_admin, activity_creator

This test executes only the input parameters against an endpoint and not the pre-processing or post-processing scripts. It is not necessary to check out the activity to test it.

**Note:** If you provide enough information for Orchestration to contact the endpoint or host and return data, you can test the input variables. You can test from any stage in the activity designer. Typically, the Execution Command stage is the point at which your inputs are ready for testing.

1. From the JDBC Execution Command, click Test Inputs.

   The list of input source variables appears. If you added default values for these variables, those values appear in the Substitute Value column. Mandatory variables are marked with a red star.

   **Note:** The test fails if the MID Server cannot be found or if it cannot connect to the target.

   ![Fill in your test values](image)

   **Figure 396: JDBC input test values**

2. Filter the variable list with these controls:
• All Inputs: Displays all input variables. This control is the default view.
• Mandatory Inputs: Displays only mandatory variables.
• Inputs Without Defaults: Shows input variables that do not have assigned default values.

3. Reset values as needed.
   • Reset default values: If values are present, this control replaces any test values set in this form with the default values.
   • Clear values: Clears all values in the input variable list, even if default values exist.

4. When your test values are configured correctly, click OK.
   The system runs the values for all the inputs configured against the specified target and returns the resulting payload. The buttons in the Response form display different views of the payload. The entire payload appears in the Raw Output window.
5. To map appropriate parameter values in the payload to variables in the Outputs stage automatically, select an **auto-mapping option**.
7. Click the X in the upper right corner of the window to close it.

Create a SOAP web service activity

Use this template to create a custom SOAP activity.

Role required: web_service_admin, activity_admin, activity_creator

For instructions on using the activity template process flow, see create custom activities.

1. Create a custom activity.
   This action creates a custom activity using a template.

2. After setting up general properties and creating input variables, configure the SOAP web service Execution Command:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Map the input variables</strong></td>
<td>Use the variables you created to configure the command that Orchestration executes on the SOAP web service.</td>
</tr>
<tr>
<td><strong>Web service message</strong></td>
<td>Specify the SOAP web service message to use for this activity. If you need information on SOAP web services messages, see SOAP message.</td>
</tr>
<tr>
<td><strong>Web service message function</strong></td>
<td>Specify the SOAP message function available in conjunction with the SOAP web service.</td>
</tr>
<tr>
<td><strong>Endpoint</strong></td>
<td>If you enter an endpoint in this field, it overrides the endpoint URL configured in the SOAP message web service. Click the lock icon to open the input field and add the endpoint.</td>
</tr>
<tr>
<td><strong>SOAP message parameters</strong></td>
<td>Name-value pairs to pass to the SOAP endpoint. You can create these parameters manually, or drag input variables into the parameter fields and then assign a value. Parameters defined in the SOAP message that use ${} can be assigned data from this activity template. Use the Additional attribute column to configure the system to not escape the text. By default, text sent to the SOAP message is escaped. The Name column is auto-populated if the users have provided variables using variable substitution in the SOAP message.</td>
</tr>
<tr>
<td><strong>Use MID Server</strong></td>
<td>Check box that determines if a MID Server must be used to invoke the SOAP web service. If the SOAP web service message function defines a MID Server, that MID Server is used instead of the one selected here.</td>
</tr>
<tr>
<td><strong>Required MID Server capabilities</strong></td>
<td>MID Server with the appropriate capabilities for connecting to the SOAP endpoint. By default, the system selects a MID Server with SOAP capabilities. This field is available when the Use MID Server check box is selected.</td>
</tr>
<tr>
<td><strong>Timeout</strong></td>
<td>Allowed duration of the SOAP web service request before it times out, in seconds. The default is 10.</td>
</tr>
<tr>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Authentication</td>
<td>Determines what type of authentication is required for the endpoint. The options are:</td>
</tr>
<tr>
<td></td>
<td>• Use existing credentials in SOAP message: Uses credential definitions from the SOAP message definition.</td>
</tr>
<tr>
<td></td>
<td>• Override with Basic Authentication credentials: Uses basic authentication credentials. Overrides the credentials in the SOAP message definition.</td>
</tr>
<tr>
<td></td>
<td>• Override with Certificate Authentication credentials: Overrides the credentials in the SOAP message definition with certificate authentication credentials.</td>
</tr>
<tr>
<td></td>
<td>• Override with Both Basic and Certificate Authentication credentials: Overrides the credentials in the SOAP message definition with both basic authentication or certificate authentication credentials.</td>
</tr>
<tr>
<td></td>
<td>• Override with WS-Security Username profile: Overrides the credentials in the SOAP message definition with credentials defined a WS Security Profile.</td>
</tr>
<tr>
<td>Credentials</td>
<td>Required REST endpoint basic authentication credentials. This field is available when Override with Basic Authentication credentials is selected in the Authentication field. Only basic authentication credentials appear in the selection list, which includes credentials stored on the instance and credential IDs from an external storage system. If you are using credentials stored in a CyberArk safe, you can override the default safe defined in the MID Server configuration file by adding the name of a different safe as a prefix to the credential ID, separated by a colon. For example, newsafe:orch-test-f5. See Configure the MID Server for CyberArk for details.</td>
</tr>
<tr>
<td>Protocol Profile</td>
<td>Protocol profile to use for authentication. This field is available when the authentication type is either Override with Certificate Authentication credentials or Override with Both Basic and Certificate Authentication credentials.</td>
</tr>
</tbody>
</table>

**Note:** You can map parameter values in a test payload to variables in the Outputs tab automatically. See `automap output variables`. 

- Use `auto-mapping` to generate outputs and parsing rules (recommended for JDBC)
• If you do not use auto-mapping, you can manually create output variables and create parsing rules

**Auto-map SOAP activity output variables**
The ServiceNow activity designer allows you to map parameter values in a SOAP test payload to variables in the Outputs stage automatically.
Role required: web_service_admin, activity_admin, activity_creator

**Note:** You can test input variables from any stage in the activity designer if you have provided enough information for Orchestration to contact the endpoint and return data. Typically, the Execution Command stage is the point at which your inputs are ready for testing.

1. In the activity designer, proceed to the Execution Command stage.
2. Define an appropriate MID Server, if requested.
   The test fails if the MID Server cannot be found or if it cannot connect to the target.
3. Click Test Activity to test the input parameters.
   If you added actual values for the parameters and fields, the system runs those values against the specified target and returns the resulting payload. If you mapped input variables to fields and parameters, the system displays a dialog box for assigning test values to those variables.
4. Provide test values, if requested, and click OK to display the payload.
   The entire payload appears in the Raw Output tab of the Response form.

5. Select one of these auto-mapping options.
   • Auto-Map to Local: Directly maps values to a local variable for use within the activity.
   • Auto-Map to Output: Directly maps values to the output variable to pass to other activities in the workflow. Auto-mapping to an output variable creates an array of objects, each of which contains the column names from the query result.

**Provide credentials to access a SOAP message WSDL**
If the SOAP WSDL you are requesting in a test payload requires authentication, you must provide basic auth credentials in either the SOAP message or the SOAP activity.
Role required: web_service_admin, activity_admin, activity_creator

The ServiceNow instance only supports basic auth credentials for accessing a WSDL. If the SOAP function or the SOAP message does not provide these credentials, you must configure them in the SOAP activity template. Orchestration uses these priorities for deciding which basic authentication credentials to use:

• SOAP message: Credentials for a SOAP message are used if no other credentials are defined.
• SOAP function: Credentials for a SOAP function override the credentials configured for the SOAP message.
• SOAP activity template: Credentials for a SOAP activity template override both the SOAP function and SOAP message credentials.

1. Navigate to System Web Services Outbound SOAP Message.
2. Select the SOAP message you want the activity to use.
3. In the SOAP Message record, select the Download WSDL check box.
4. In the Authentication type field, select Basic.
   The Basic auth profile field appears.
5. Select the basic auth profile to use with this SOAP message.
6. Alternately, you can configure basic authentication credentials in *Configure the SOAP execution command* on page 2043.
   a) In the Authentication field, select Override with Basic Authentication credentials.
The Credentials field appears.

b) Select the basic auth credentials to use to access the WSDL. This setting overrides any credentials configured in the SOAP message.

Figure 399: Override basic auth credentials

Configure the SOAP execution command
Use the input variables you created to configure the command that Orchestration executes on the SOAP endpoint.
Create the input variables you need in the Inputs form before you can advance to the Execution Command stage.

Role required: web_service_admin, activity_admin, activity_creator

**Note:** You can test the SOAP connection between the MID Server and the endpoint without having to run the activity in a workflow context. For details, see *test template outputs*.

1. Drag variables from the list of inputs and drop them into command fields. The system formats the variable in the proper syntax for the command.
Figure 400: SOAP execution command

2. Complete the fields shown in the table.
Table 968: SOAP template execution command fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>Input variable builder. Create input variables on page 2000 to map to available fields.</td>
</tr>
<tr>
<td>Web service message</td>
<td>SOAP message to use for this activity. Users must have the web_service_admin role to configure this field.</td>
</tr>
<tr>
<td>Web service message function</td>
<td>SOAP message function to use for this activity. Users must have the web_service_admin role to configure this field.</td>
</tr>
<tr>
<td>Endpoint</td>
<td>Endpoint URL for the SOAP web service this activity uses. Enter an endpoint in this field to override the endpoint configured in the SOAP message. Click the lock icon to open the input field.</td>
</tr>
<tr>
<td>SOAP message parameters</td>
<td>Name-value pairs to pass to the SOAP endpoint. You can create these parameters manually, or drag input variables into the parameter fields and then assign a value. Parameters defined in the SOAP message that use $() can be assigned data from this activity template. Use the Additional attribute column to configure the system to not escape the text. By default, text sent to the SOAP message is escaped. The Name column is auto-populated if the users have provided variables using variable substitution in the SOAP message.</td>
</tr>
<tr>
<td>Use MID Server</td>
<td>Check box that determines if a MID Server must be used to invoke the SOAP web service.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong></td>
</tr>
<tr>
<td></td>
<td>If the SOAP web service message function defines a MID Server, that MID Server is used instead of the one selected here.</td>
</tr>
<tr>
<td>Required MID Server capabilities</td>
<td>MID Server with the appropriate capabilities for connecting to the SOAP endpoint. By default, the system selects a MID Server with SOAP capabilities. This field is available when the Use MID Server check box is selected.</td>
</tr>
<tr>
<td>Timeout</td>
<td>Allowed duration of the SOAP web service request before it times out, in seconds. The default is 10.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Authentication        | Determines what type of authentication is required for the endpoint. The options are:  
  • Use existing credentials in SOAP message: Uses credential definitions from the SOAP message definition.  
  • Override with Basic Authentication credentials: Uses basic authentication credentials. Overrides the credentials in the SOAP message definition. Basic authentication credentials must be provisioned before they are available for selection.  
  • Override with Certificate Authentication credentials: Overrides the credentials in the SOAP message definition with certificate authentication credentials.  
  • Override with Both Basic and Certificate Authentication credentials: Overrides the credentials in the SOAP message definition with both basic authentication or certificate authentication credentials.  
  • Override with WS-Security Username profile: Overrides the credentials in the SOAP message definition with credentials defined a WS Security Profile.  
| Credentials           | Required REST endpoint basic authentication credentials. This field is available when Override with Basic Authentication credentials is selected in the Authentication field. Only basic authentication credentials appear in the selection list, which includes credentials stored on the instance and credential IDs from an external storage system. If you are using credentials stored in a CyberArk safe, you can override the default safe defined in the MID Server configuration file by adding the name of a different safe as a prefix to the credential ID, separated by a colon. For example, newsafe:orch-test-f5.  
| Protocol Profile      | Protocol profile to use for authentication. This field is available when the authentication type is either Override with Certificate Authentication credentials or Override with Both Basic and Certificate Authentication credentials.  

3. Click Save.  
4. Click Continue to advance to the Outputs stage.
**SOAP template execution parameters**

You use execution parameters to create the input process script in the Pre processing form of the activity designer.

For descriptions of the SOAP web service command fields, see the table in *Configure the SOAP execution command* on page 2043.

**Note:** You must use the `executionParam.` prefix with all variables in this table.

<table>
<thead>
<tr>
<th>Name</th>
<th>Variable</th>
<th>Type</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web service message</td>
<td><code>web_service_message</code></td>
<td>Reference</td>
<td>The <code>sys_id</code> of the corresponding SOAP message.</td>
</tr>
<tr>
<td>Web service message function</td>
<td><code>web-service_message_function</code></td>
<td>Reference</td>
<td>The <code>sys_id</code> of the SOAP message function.</td>
</tr>
<tr>
<td>Web service endpoint</td>
<td><code>web_service_endpoint</code></td>
<td>String</td>
<td>URL of the SOAP endpoint.</td>
</tr>
<tr>
<td>Parameters</td>
<td><code>parameters</code></td>
<td>Array of JavaScript objects</td>
<td>Array of JavaScript objects, expressed with the <code>executionParam.</code> prefix. For instructions on creating arrays using this parameter, see <em>Create a JavaScript array in a SOAP template</em> on page 2049.</td>
</tr>
<tr>
<td>Use mid server</td>
<td><code>use_mid_server</code></td>
<td>Boolean</td>
<td>When true, indicates that a MID Server is used.</td>
</tr>
<tr>
<td>MidCapabilities</td>
<td><code>midCapabilities</code></td>
<td>String (comma separated)</td>
<td>List of references to required MID Server capabilities.</td>
</tr>
<tr>
<td>Time out</td>
<td><code>time_out</code></td>
<td>String</td>
<td>Allowed duration of the SOAP web service request before it times out, in seconds. The default is 10.</td>
</tr>
<tr>
<td>Name</td>
<td>Variable</td>
<td>Type</td>
<td>Usage</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------</td>
<td>---------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| ValueCapabilities    | valueCapabilities | Array of hashmap          | Capability values used to select the MID Server. For more information, see [MID Server capabilities](#) on page 1716. Use this example to customize the MID Server selection if there are additional capabilities that are assigned by value:  
  ```javascript
  var valueCapability = {'NEW_MID_CAPABILITY': 'NEW_MID_CAPABILITY_VALUE'};
  executionParam.valueCapabilities.push(valueCapability);
  ``` |
| Auth Type            | auth_type | Boolean                   | Type of credentials to use. The choices are:                                                                                                                                                     |
|                      |           |                           | • basic_auth_pick_credentials  
|                      |           |                           | • use_existing_credentials |
| Credentials          | credentials | Reference               | Credentials to use for this SOAP message when the auth_type is basic_auth_pick_credentials.                                                                                                      |

*Create a JavaScript array in a SOAP template*

These are instructions for creating JavaScript arrays using SOAP execution parameters.

Role required: web_service_admin, activity_admin, activity_creator

To add more name-value pairs to the parameter's array, append the values to the existing array.

1. Create a JavaScript object with the following syntax, and add it to the executionParam.parameter array:

   ```javascript
   var newParameter = {
   "name": "parameterName",
   "value": "parameterValue",
   "additional_attribute": "none"
   }; 
   executionParam.parameters.push(newParameter);
   ```

   By adding the new parameter JavaScript object to the array, you ensure that any elements already available in the array are not impacted.

2. Make sure to set the value in the Additional attribute column in the SOAP message parameters input field to Do not escape text.

   In this case, the system does not escape the value specified for the value attribute. An example of this is:

   ```javascript
   var newParameter = {
   "name": "parameterName",
   "value": "parameterValue",
   "additional_attribute": "do_not_escape_text"
   }; 
   executionParam.parameters.push(newParameter);
   ```

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Note: If the value for the additional_attribute field is None, then the system escapes the value specified by the value attribute. In the first example, parameterValue is escaped.

SOAP template post-processing parameters
Use these parameters to create a post-processing script.

Table 970: Activity designer post-processing parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Variable</th>
<th>Type</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status code</td>
<td>status_code</td>
<td>Integer</td>
<td>Contains the status code returned from the web service.</td>
</tr>
<tr>
<td>Header</td>
<td>header</td>
<td>Hashmap of JavaScript object</td>
<td>Contains the key value paired hashmap associated with the header values passed into the web service. You can access each value with executionResult.header[keyName].</td>
</tr>
<tr>
<td>Body</td>
<td>body</td>
<td>String</td>
<td>Contains a string value representing the output from the SOAP message</td>
</tr>
<tr>
<td>Error</td>
<td>error</td>
<td>String</td>
<td>Returns the error string from the SOAP web service, unless there are no errors, in which case it returns null.</td>
</tr>
</tbody>
</table>

Create a JavaScript Probe activity
Create a JavaScript Probe activity to instruct a MID server to execute server-side javascript.
Role required: activity_creator or workflow_admin
The JavascriptProbe activity has the same functionality as making 'Packages' calls into standard Java libraries. It allows you to have more control over the Java libraries on the MID Server. You can load your own JAR files on the MID Server and have the JavascriptProbe make Package calls into those java files.

1. Create a custom activity.
   This action creates a custom activity using a template.
2. After setting up general properties and creating input variables, configure the JavaScript probe activity.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Map the input variables</td>
<td>Use the variables you created to configure the command that Orchestration executes on the MID server.</td>
</tr>
<tr>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Script type</td>
<td>Select the type of script to include. Available options are:</td>
</tr>
<tr>
<td></td>
<td>• Custom JavaScript</td>
</tr>
<tr>
<td></td>
<td>• MID Server script include</td>
</tr>
<tr>
<td>Script</td>
<td>Custom JavaScript to run with this probe.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This field is available when the Script type selected is Custom JavaScript.</td>
</tr>
<tr>
<td>MID Server script include</td>
<td>Script for the MID Server to run with this probe.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This field is available when the Script type selected is MID Server script include.</td>
</tr>
<tr>
<td>Select MID Server by host</td>
<td>MID Server on which the probe runs.</td>
</tr>
<tr>
<td>Required MID Server capabilities</td>
<td>MID Server to use, by capabilities.</td>
</tr>
<tr>
<td>Parameters</td>
<td>Name-value pairs to pass to the host with this probe. You can create these parameters manually, or drag input variables into the Parameters fields and assign a value.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> You can map parameter values in a test payload to variables in the Outputs tab automatically. See <a href="#">automap output variables</a>.</td>
</tr>
</tbody>
</table>

Finish creating your JavaScript probe activity by [creating output variables](#), [creating a parsing rule](#), or [creating template conditions](#). Refer to the [create custom activities](#) topic to know your template options.

*JavaScript probe template execution parameters*

You use execution parameters to create the input process script in the Preprocessing form of the activity designer.

For descriptions of the JavaScript Probe command fields, see the table in Configure the JavaScript Probe execution command on page 2053.

**Note:** You must use the `executionParam` prefix with all variables in this table.

Table 971: JavaScript template execution parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Variable</th>
<th>Type</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Script Type</td>
<td>script_type</td>
<td>Enumerated</td>
<td>Type of script to run. The possible types are:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• <code>custom_javascript_type</code></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• <code>mid_script_include_type</code></td>
</tr>
<tr>
<td>Name</td>
<td>Variable</td>
<td>Type</td>
<td>Usage</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------</td>
<td>-----------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Script</td>
<td>script</td>
<td>String</td>
<td>Script that runs custom JavaScript when the script_type is custom_javascript_type.</td>
</tr>
<tr>
<td>Mid script include</td>
<td>mid_script_include</td>
<td>Reference</td>
<td>The sys_id reference associated with the MID Server script include to call, when the script_type is mid_script_include_type.</td>
</tr>
<tr>
<td>Source</td>
<td>source</td>
<td>String</td>
<td>Target host on which to run the script.</td>
</tr>
<tr>
<td>MidCapabilities</td>
<td>midCapabilities</td>
<td>String (comma separated)</td>
<td>List of required MID Server capabilities.</td>
</tr>
<tr>
<td>Parameters</td>
<td>parameters</td>
<td>Array of JavaScript object</td>
<td>Array of JavaScript objects, expressed with the executionParam. prefix. To add more name-value pairs to the parameters array, append them to the existing array. Create a JavaScript object with the following syntax, and add it to the executionParam.parameter array. This assigns additional parameters to the message: var newParameter = {'name':&quot;parameterName&quot;,&quot;value&quot;:&quot;parameterValue&quot;}; executionParam.parameters.push(newParameter);</td>
</tr>
<tr>
<td>ValueCapabilities</td>
<td>valueCapabilities</td>
<td>Array of hashmap</td>
<td>Capability values used to select the MID Server. For more information, see MID Server capabilities on page 1716. If there are additional capabilities that are assigned by value, use this example to customize the MID Server selection: var valueCapability = {'NEW_MID_CAPABILITY':&quot;NEW_MID_CAPABILITY_VALUE&quot;}; executionParam.valueCapabilities.push(valueCapability);</td>
</tr>
</tbody>
</table>
JavaScript probe template post-processing parameters
Use these parameters to create a post-processing script.

<table>
<thead>
<tr>
<th>Name</th>
<th>Variable</th>
<th>Type</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Payload</td>
<td>payload</td>
<td>String</td>
<td>Contains raw payload returned from the JavaScript Probe.</td>
</tr>
<tr>
<td>Output</td>
<td>output</td>
<td>String</td>
<td>Contains output data returned from the JavaScript Probe.</td>
</tr>
<tr>
<td>EccSysId</td>
<td>eccSysId</td>
<td>String</td>
<td>Contains the reference ID associated with the ECC Queue input message.</td>
</tr>
<tr>
<td>Error Messages</td>
<td>errorMessages</td>
<td>String</td>
<td>Contains the error messages returned from the JavaScript probe. If no error messages are returned, this value is null.</td>
</tr>
</tbody>
</table>

Configure the JavaScript Probe execution command
Use the input variables you created to configure the command that Orchestration executes on the JavaScript Probe target host.

Create the input variables you need in the Inputs form before you can advance to the Execution Command stage.

Role required: activity_creator, admin

**Note:** You can test the JavaScript Probe connection between the MID Server and the target without having to run the activity in a workflow context. For details, see test template outputs.

1. Drag variables from the list of inputs and drop them into command fields. The system formats the variable in the proper syntax for the command.
Figure 401: JavaScript Probe execution command

```javascript
var str = new Packages.java.lang.String("TestString");
this.probe.createOutputResult(str);
```
2. Complete the fields shown in the table.

### Table 973: JavaScript Probe execution command fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>Input variable builder. <a href="#">Create input variables on page 2000 to map to available fields.</a></td>
</tr>
<tr>
<td>Script type</td>
<td>Select the type of script to include. Available options are:</td>
</tr>
<tr>
<td></td>
<td>• Custom JavaScript</td>
</tr>
<tr>
<td></td>
<td>• MID Server script include</td>
</tr>
<tr>
<td>Script</td>
<td>Custom JavaScript to run with this probe. This field is available when the Script type selected is Custom JavaScript.</td>
</tr>
<tr>
<td>MID Server script include</td>
<td>Script for the MID Server to run with this probe. This field is available when the Script type selected is MID Server script include.</td>
</tr>
<tr>
<td>Select MID Server by host</td>
<td>MID Server on which the probe runs.</td>
</tr>
<tr>
<td>Required MID Server</td>
<td>MID Server to use, by capabilities.</td>
</tr>
<tr>
<td>capabilities</td>
<td></td>
</tr>
<tr>
<td>Parameters</td>
<td>Name-value pairs to pass to the host with this probe. You can create these parameters manually, or drag input variables into the Parameters fields and assign a value.</td>
</tr>
</tbody>
</table>

3. Click Save.
4. Click Continue to advance to the Outputs stage.

### Create a PowerShell activity

Create a custom PowerShell activity return data to a workflow from a host using Microsoft PowerShell.

Role required: activity_creator or workflow_admin

ServiceNow supports PowerShell 2.0 and above. PowerShell 3.0 does not support Windows 2003 Server.

1. Create a custom activity.
   This action creates a custom activity using a template.
2. After setting up general properties and creating input variables, configure the PowerShell Execution Command:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Map the input variables</td>
<td>Use the variables you created to configure the command that Orchestration executes on the MID Server.</td>
</tr>
<tr>
<td>Target host</td>
<td>Host name or IP address of the target server for this PowerShell activity.</td>
</tr>
<tr>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Script type</strong></td>
<td>Type of PowerShell script to run on the PowerShell host. Available options are:</td>
</tr>
<tr>
<td></td>
<td>• Custom PowerShell command</td>
</tr>
<tr>
<td></td>
<td>• MID Server script file</td>
</tr>
<tr>
<td><strong>MID Server script file</strong></td>
<td>The MID Server script file contains the PowerShell scripts. This field is available when the Script type selected is MID Server script file.</td>
</tr>
<tr>
<td><strong>Command</strong></td>
<td>PowerShell command the activity executes. This field is available when the Script type selected is Custom PowerShell command. You can create your commands by dragging and dropping input variables from the variable builder into this field.</td>
</tr>
<tr>
<td><strong>PowerShell variables</strong></td>
<td>Name-value pairs to pass to the host with PowerShell. You can create these variables manually, or drag input variables into the Value field. Encrypted input variables retain their encryption, regardless of the data type settings in this field. If you type in a value and select the Encrypted data type, your value appears in plain text. It is only encrypted when it passes to the ECC Queue.</td>
</tr>
<tr>
<td><strong>Use MID Service Account</strong></td>
<td>If checked, this activity authenticates on the target host using the credentials of the MID Server service account only, without trying any other credentials.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> The Credential tag field is not available.</td>
</tr>
<tr>
<td><strong>Credential tag</strong></td>
<td>Credential tag this activity must use to run PowerShell commands on the host. If this field is left blank, the MID Server tries all the available credentials until it finds a valid one, ending with the MID Server service account. If a credential tag is defined, the MID Server tries the credentials with that tag specified only and does not try the MID Server service account.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This field is not available when the Use MID service account check box is selected.</td>
</tr>
<tr>
<td><strong>Required MID Server capabilities</strong></td>
<td>MID Server to use for querying PowerShell, by capabilities. By default, the system selects a PowerShell MID Server.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> You can map parameter values in a test payload to variables in the Outputs tab automatically. See automap output variables.</td>
</tr>
</tbody>
</table>
Finish creating your PowerShell activity by creating output variables, creating a parsing rule, or creating template conditions. Refer to the create custom activities topic to know your template options.

**PowerShell template execution parameters**

You use execution parameters to create the input process script in the Pre Processing form of the activity designer.

For descriptions of the Powershell command fields, see the table in [Configure the PowerShell execution command](#) on page 2002.

**Note:** You must use the executionParam. prefix with all variables in this table.

<table>
<thead>
<tr>
<th>Name</th>
<th>Variable</th>
<th>Type</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
<td>source</td>
<td>String</td>
<td>Target host on which to execute the command.</td>
</tr>
<tr>
<td>Script type</td>
<td>script_type</td>
<td>Enumeration</td>
<td>Type of script to run. The possible types are:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• command: Custom PowerShell command.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• file: Identifies the MID Server script file to run.</td>
</tr>
<tr>
<td>Command</td>
<td>command</td>
<td>String</td>
<td>Command sent to the MID Server for it to run on the target host.</td>
</tr>
<tr>
<td>MidScriptFile</td>
<td>midScriptFile</td>
<td>Reference</td>
<td>Reference sys_id of the MID Server script file to execute, when the script_type is file.</td>
</tr>
<tr>
<td>PowershellVariables</td>
<td>powershellVariables</td>
<td>Array of hashmap</td>
<td>Hashmap of JavaScript objects with name, value, and type for each object. The type of each object can be one of plain, encrypted, boolean, or null, corresponding to the PowerShell variable type selected in the inputs tab. For example, you might enter:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>var newParameter = { &quot;name&quot; : &quot;parameterName&quot;, &quot;value&quot; : &quot;ParameterValue&quot;, &quot;type&quot; : &quot;plain&quot; }; executionParam.powershellVariables.push(newParameter);</td>
</tr>
<tr>
<td>Name</td>
<td>Variable</td>
<td>Type</td>
<td>Usage</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------</td>
<td>-----------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Credential tag</td>
<td>credential_tag</td>
<td>String</td>
<td>Specific credential tag this activity must use to run PowerShell commands on the host.</td>
</tr>
<tr>
<td>MidCapabilities</td>
<td>midCapabilities</td>
<td>String (comma separated)</td>
<td>List of required MID Server capabilities.</td>
</tr>
<tr>
<td>ValueCapabilities</td>
<td>valueCapabilities</td>
<td>Array of hashmap</td>
<td>Capability values used to select the MID Server. For more information, see MID Server capabilities on page 1716. If there are additional capabilities that are assigned by value, use this example to customize the MID Server selection: var valueCapability = {'NEW_MID_CAPACITY': 'NEW_MID_CAPACITY_VALUE'}; executionParam.valueCapabilities.push(valueCapability);</td>
</tr>
</tbody>
</table>

*Powershell post-processing parameters and payload parsing*

Use these parameters to create a post-processing script, payload parsing, and tagging.
### Table 975: Powershell post-processing parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Variable</th>
<th>Type</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tags</td>
<td>tags</td>
<td>Hashmap of tag values to return from the PowerShell command.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Contains the tags used to extract output using the PowerShell commands. The tag output is delimited by double percentage signs, as in <code>%%tagname%% ... %</code>. Set up the command using the format in this example:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><code>Write-Host % $tagname1%% output1 line 1 output1 line 2 ... Write-Host%% Write-Host % $tagname2%% output2 line 1 output2 line 2 ... Write-Host%%</code></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The tags returned are JavaScript hashmap objects in which each key is prefixed with tag appended with the tagname.</td>
</tr>
</tbody>
</table>
|        |          |      | `{"__text__": ", "tagtagname1":"output1 line1
output1 line2
", "tagtagname2":"output2 line1
output2 line2
"} |
<p>| Hresult| hresult  | String | Contains any hresult returned from the PowerShell command. If no hresult is returned, this parameter is null. |
| Output | output   | String | Contains the raw output from the PowerShell command. |
| EccSysID | eccSysID | String | Contains the reference ID associated with the ECC Queue input message returned by the activity. |</p>
<table>
<thead>
<tr>
<th>Name</th>
<th>Variable</th>
<th>Type</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>ErrorMessages</td>
<td>errorMessages</td>
<td>String</td>
<td>Contains any error messages retrieved from the PowerShell command. This value is null if there are no error messages.</td>
</tr>
</tbody>
</table>

Create a REST web service activity

Use this procedure to create a custom REST web service Orchestration activity.

Role required: web_service_admin, activity_admin, activity_creator

To create and use a REST web service workflow activity:

- Create a **REST message** if an appropriate one is not already configured.
- Assign the web_service_admin role to any user who must create or edit a custom REST activity.
- Determine an application, or **scope**, for this activity.
- Determine the **REST endpoint** to use for the activity. Use this value to override the endpoint configured in the REST message.
- Optionally, create **basic authentication credentials**. Use this value to override the credentials configured in the SOAP message.

1. Create a **custom activity**.
   This action creates a custom activity using a template.

2. After setting up **general properties** and **creating input variables**, configure the REST web service Execution Command:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Map the input variables</strong></td>
<td>Use the variables you created to configure the command that Orchestration executes.</td>
</tr>
<tr>
<td><strong>REST message</strong></td>
<td>Name of an existing REST message to use in this activity.</td>
</tr>
<tr>
<td><strong>REST message function</strong></td>
<td>REST message function to use for this activity.</td>
</tr>
<tr>
<td><strong>Endpoint</strong></td>
<td>Endpoint URL for the REST web service this activity uses. Enter an endpoint in this field to override the endpoint configured in the REST message. Click the lock to open the input field.</td>
</tr>
<tr>
<td><strong>Variable substitutions</strong></td>
<td>Name-value pairs to pass to the REST endpoint. You can create these parameters manually, or drag input variables into the parameter fields, and then assign a value. Parameters defined in the REST message that use $() can be assigned data from this activity template. Use the Additional attribute column to configure the system to not escape the text. By default the text sent to the REST message is escaped. If the users have provided variables using variable substitution in the REST message, then the Name column is automatically populated.</td>
</tr>
<tr>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Additional Headers</td>
<td>Additional HTTP header parameters for the REST message selected. You can also use these values to override parameters inherited from the REST message.</td>
</tr>
<tr>
<td>Additional Query Parameters</td>
<td>Additional query parameters for the REST message selected. You can also use these values to override parameters inherited from the REST message.</td>
</tr>
<tr>
<td>Use MID Server</td>
<td>Check box that determines if a MID Server should be used to invoke the REST web service.</td>
</tr>
<tr>
<td>Note:</td>
<td>If the REST web service message function defines a MID Server, that MID Server is used instead of the one selected here.</td>
</tr>
<tr>
<td>Required MID Server capabilities</td>
<td>MID Server with the appropriate capabilities for connecting to the REST endpoint. By default, the system selects a MID Server with REST capabilities. This field is available when the Use MID Server check box is selected.</td>
</tr>
<tr>
<td>Timeout</td>
<td>Allowed duration of the REST web service request before it times out, in seconds. The default is 10.</td>
</tr>
<tr>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Authentication</strong></td>
<td>Determines what type of authentication is required for the endpoint. The options are:</td>
</tr>
<tr>
<td></td>
<td>• Use existing credentials in REST message: Uses credential definitions from the REST message definition.</td>
</tr>
<tr>
<td></td>
<td>• Override with Basic Authentication credentials: Uses basic authentication credentials to override the credentials in the REST message definition. Basic authentication credentials must be provisioned before they are available for selection.</td>
</tr>
<tr>
<td></td>
<td>• Override with Certificate Authentication credentials: Uses a certificate, such as a private key, to override the credentials in the REST message definition.</td>
</tr>
<tr>
<td></td>
<td>• Override with Both Basic and Certificate Authentication credentials: Uses both basic authentication and certificate authentication to override the credentials in the REST message definition.</td>
</tr>
<tr>
<td></td>
<td>• Override with OAuth Authentication credentials: Uses OAuth 2.0 credentials to override the credentials in the REST message definition. The REST message selected for this activity must have its <strong>Authentication type</strong> set to OAuth 2.0 and its <strong>OAuth profile</strong> configured appropriately.</td>
</tr>
<tr>
<td><strong>Credentials</strong></td>
<td>Required REST endpoint basic authentication credentials. This field is available when Override with Basic Authentication credentials is selected in the Authentication field. Only basic authentication credentials appear in the selection list, which includes credentials stored on the instance and credential IDs from an external storage system. If you are using credentials stored in a CyberArk safe, you can override the default safe defined in the MID Server configuration file. See <strong>Configure the MID Server for CyberArk</strong> for details. Add the name of a different safe as a prefix to the credential ID, separated by a colon. For example, newsafe:orch-test-f5.</td>
</tr>
<tr>
<td><strong>Protocol Profile</strong></td>
<td>Certificate authentication to use. This field is available when the selections in the Authentication are either Override with Certificate Authentication credentials or Override with Both Basic and Certificate Authentication credentials.</td>
</tr>
<tr>
<td><strong>OAuth profile</strong></td>
<td>Profile for the OAuth provider for this REST message. See <strong>Specify an OAuth profile</strong> for more information.</td>
</tr>
</tbody>
</table>
**Note:** You can map parameter values in a test payload to variables in the Outputs tab automatically. See *automap output variables*.

Finish creating your Rest web service activity by *creating output variables*, *creating a parsing rule*, or *creating template conditions*. Refer to the *create custom activities* topic to know your template options.

**Auto-map REST activity output variables**

The ServiceNow activity designer allows you to map parameter values in a REST test payload to variables in the Outputs stage automatically.

Role required: web_service_admin, activity_admin, activity_creator

**Note:** You can test input variables from any stage in the activity designer if you have provided enough information for Orchestration to contact the endpoint and return data. Typically, the Execution Command stage is the point at which your inputs are ready for testing.

1. In the activity designer, proceed to the Execution Command stage.
2. Define an appropriate MID Server, if requested.
   The test fails if the MID Server cannot be found or if it cannot connect to the target.
3. Click Test Activity to test the input parameters.
   If you added actual values for the parameters and fields, the system runs those values against the specified target and returns the resulting payload. If you mapped input variables to fields and parameters, the system displays a dialog box for assigning test values to those variables.
4. Provide test values, if requested, and click OK to display the payload.
   The entire payload appears in the Raw Output tab of the Response form.

5. Select one of these auto-mapping options.
   - Auto-Map to Local: Directly maps values to a local variable for use within the activity.
   - Auto-Map to Output: Directly maps values to the output variable to pass to other activities in the workflow. Auto-mapping to an output variable creates an array of objects, each of which contains the column names from the query result.

**REST template execution parameters**

You use execution parameters to create the input process script in the Pre Processing form of the activity designer.

For descriptions of the REST web service command fields, see *Configure the REST execution command* on page 2066.

**Note:** You must use the executionParam. prefix with all variables in this table.
<table>
<thead>
<tr>
<th>Name</th>
<th>Variable</th>
<th>Type</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web service message</td>
<td>web_service_message</td>
<td>Reference</td>
<td>The sys_id of the corresponding web service message.</td>
</tr>
<tr>
<td>Web service message function</td>
<td>web_service_message_function</td>
<td>Reference</td>
<td>The sys_id of the REST message function.</td>
</tr>
<tr>
<td>Web service endpoint</td>
<td>web_service_endpoint</td>
<td>String</td>
<td>URL of the REST endpoint.</td>
</tr>
<tr>
<td>Parameters</td>
<td>parameters</td>
<td>Array of JavaScript objects</td>
<td>Array of JavaScript objects, expressed with the executionParam. prefix. For instructions on creating arrays using this parameter see <a href="#">Create a JavaScript array in a REST template</a> on page 2065.</td>
</tr>
<tr>
<td>Use mid server</td>
<td>use_mid_server</td>
<td>Boolean</td>
<td>Selects whether or not to use the MID Server. A value of true uses the MID Server, and a value of false does not use the MID Server.</td>
</tr>
<tr>
<td>MidCapabilities</td>
<td>midCapabilities</td>
<td>String (comma separated)</td>
<td>List of references to required MID Server capabilities.</td>
</tr>
<tr>
<td>Time out</td>
<td>time-out</td>
<td>String</td>
<td>Allowable time out duration, expressed in seconds.</td>
</tr>
<tr>
<td>ValueCapabilities</td>
<td>valueCapabilities</td>
<td>Array of hashmap</td>
<td>Capability values used to select the MID Server. For more information, see <a href="#">MID Server capabilities</a> on page 1716. Use this example to customize the MID Server selection if there are additional capabilities that are assigned by value: var valueCapability = {'NEW_MID_CAPABILITY': 'NEW_MID_CAPABILITY_VALUE'}; executionParam.valueCapabilities.push(valueCapability);</td>
</tr>
</tbody>
</table>
Create a JavaScript array in a REST template

These are instructions for creating JavaScript arrays using REST execution parameters.

Role required: web_service_admin, activity_admin, activity_creator

To add more name-value pairs to the parameter's array, append the values to the existing array.

1. Create a JavaScript object with the following syntax, and add it to the executionParam.parameter array:

   ```javascript
   var newParameter = {
     "name": "parameterName",
     "value": "parameterValue",
     "additional_attribute": "none"
   };
   executionParam.parameters.push(newParameter);
   ```

   By adding the new parameter JavaScript object to the array, you ensure that any elements already available in the array are not impacted.

2. Make sure to set the value in the Additional attribute column in the REST message parameters input field to Do not escape text.

   In this case, the system does not escape the value specified for the value attribute. An example of this is:

   ```javascript
   var newParameter = {
     "name": "parameterName",
     "value": "parameterValue",
     "additional_attribute": "do_not_escape_text"
   };
   executionParam.parameters.push(newParameter);
   ```

   **Note:** If the value for the additional_attribute field is None, then the system escapes the value specified by the value attribute. In the first example, parameterValue is escaped.

REST template post-processing parameters

Use these parameters to create a post-processing script.

<table>
<thead>
<tr>
<th>Name</th>
<th>Variable</th>
<th>Type</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status code</td>
<td>status_code</td>
<td>Integer</td>
<td>Contains the status code returned from the REST web service.</td>
</tr>
<tr>
<td>Name</td>
<td>Variable</td>
<td>Type</td>
<td>Usage</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
<td>------</td>
<td>-------</td>
</tr>
<tr>
<td>Header</td>
<td>header</td>
<td>Hashmap of JavaScript object</td>
<td>Hashmap of key value pairs associated with the header values passed into the web service. You can access each value with executionResult.header[keyName].</td>
</tr>
<tr>
<td>Body</td>
<td>body</td>
<td>String</td>
<td>Contains a string value representing the output from the REST message</td>
</tr>
<tr>
<td>Error</td>
<td>error</td>
<td>String</td>
<td>Returns the error string from the REST web service, unless there are no errors, in which case it returns null.</td>
</tr>
</tbody>
</table>

Configure the REST execution command

Use the input variables you created to configure the command that Orchestration executes on the REST endpoint.

Create the input variables you need in the Inputs form before you can advance to the Execution Command stage.

Role required: web_service_admin, activity_admin, activity_creator

**Note:** You can test the REST connection between the MID Server and the endpoint without having to run the activity in a workflow context. For details, see test template outputs.

1. Drag variables from the list of inputs and drop them into command fields. The system formats the variable in the proper syntax for the command.
Figure 402: REST execution command
2. Complete the fields shown in the table.

**Table 978: REST execution command fields**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>Input variable builder. Create input variables on page 2000 to map to available fields.</td>
</tr>
<tr>
<td>REST message</td>
<td>Name of an existing REST message to use in this activity. Users must have the web_service_admin role to configure this field.</td>
</tr>
<tr>
<td>REST message function</td>
<td>REST message function to use for this activity. Users must have the web_service_admin role to configure this field.</td>
</tr>
<tr>
<td>Endpoint</td>
<td>Endpoint URL for the REST web service this activity uses. Enter an endpoint in this field to override the endpoint configured in the REST message. Click the lock to open the input field.</td>
</tr>
<tr>
<td>Variable substitutions</td>
<td>Name-value pairs to pass to the REST endpoint. You can create these parameters manually, or drag and drop input variables into the parameter fields, and then assign a value. Parameters defined in the REST message that use ${} can be assigned data from this activity template. Use the Additional attribute column to configure the system to not escape the text. By default the text sent to the REST message is escaped. The Name column is automatically populated if the users have provided variables using variable substitution in the REST message.</td>
</tr>
<tr>
<td>Additional Headers</td>
<td>Additional HTTP header parameters for the REST message selected. You can also use these values to override parameters inherited from the REST message.</td>
</tr>
<tr>
<td>Additional Query Parameters</td>
<td>Additional query parameters for the REST message selected. You can also use these values to override parameters inherited from the REST message.</td>
</tr>
<tr>
<td>Use MID Server</td>
<td>Check box that determines if a MID Server should be used to invoke the REST web service.</td>
</tr>
</tbody>
</table>

**Note:** If the REST web service message function defines a MID Server, that MID Server is used instead of the one selected here.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required MID Server capabilities</td>
<td>MID Server with the appropriate <em>capabilities</em> for connecting to the REST endpoint. By default, the system selects a MID Server with REST capabilities. This field is available when the Use MID Server check box is selected.</td>
</tr>
<tr>
<td>Timeout</td>
<td>Allowed duration of the REST web service request before it times out, in seconds. The default is 10.</td>
</tr>
<tr>
<td>Authentication</td>
<td>Determines what type of authentication is required for the endpoint. The options are:</td>
</tr>
<tr>
<td></td>
<td>• Use existing credentials in REST message: Uses credential definitions from the REST message definition.</td>
</tr>
<tr>
<td></td>
<td>• Override with Basic Authentication credentials: Uses <em>basic authentication</em> credentials to override the credentials in the REST message definition. Basic authentication credentials must be provisioned before they are available for selection.</td>
</tr>
<tr>
<td></td>
<td>• Override with Certificate Authentication credentials: Uses a certificate, such as a private key, to override the credentials in the REST message definition.</td>
</tr>
<tr>
<td></td>
<td>• Override with Both Basic and Certificate Authentication credentials: Uses both basic authentication and certificate authentication to override the credentials in the REST message definition.</td>
</tr>
<tr>
<td></td>
<td>• Override with OAuth Authentication credentials: Uses <em>OAuth 2.0</em> credentials to override the credentials in the REST message definition. The REST message selected for this activity must have its <em>Authentication type</em> set to OAuth 2.0 and its <em>OAuth profile</em> configured appropriately.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Credentials</td>
<td>Required REST endpoint basic authentication credentials. This field is available when Override with Basic Authentication credentials is selected in the Authentication field. Only basic authentication credentials appear in the selection list, which includes credentials stored on the instance and credential IDs from an external storage system. If you are using credentials stored in a CyberArk safe, you can override the default safe defined in the MID Server configuration file by adding the name of a different safe as a prefix to the credential ID, separated by a colon. For example, newsafe:orch-test-f5.</td>
</tr>
<tr>
<td>Protocol Profile</td>
<td>Certificate authentication to use. This field is available when the selections in the Authentication field is either Override with Certificate Authentication credentials or Override with Both Basic and Certificate Authentication credentials.</td>
</tr>
<tr>
<td>OAuth profile</td>
<td>Profile for the OAuth provider for this REST message. See Specify an OAuth profile for more information.</td>
</tr>
</tbody>
</table>

3. Click Save.
4. Click Continue to advance to the Outputs stage.

Create an SFTP activity

Create an activity that executes basic SFTP commands on a remote server.

Roles required: activity_creator or workflow_admin

You can create a custom activity that manages files and directories on a target host or copies a file from one SFTP server to another. The file content is streamed through a MID Server, which avoids having to store the data on the hard drive of the MID Server host machine.

**Note:** This activity requires the credentials of a user who can execute SFTP commands on the source host. The Copy File activity, provided in the activity pack, requires separate credentials to access the target host.

1. Create a custom activity.
   This action creates a custom activity using a template.
2. After setting up general properties and creating input variables, configure the SFTP Execution Command:
<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Command</strong></td>
<td>Type of activity to create. The choices are:</td>
</tr>
<tr>
<td></td>
<td>• Copy file</td>
</tr>
<tr>
<td></td>
<td>• Create directory</td>
</tr>
<tr>
<td></td>
<td>• Get file list</td>
</tr>
<tr>
<td></td>
<td>• Remove file or directory</td>
</tr>
<tr>
<td></td>
<td>• Rename file or directory</td>
</tr>
<tr>
<td></td>
<td>• Set file attributes</td>
</tr>
<tr>
<td><strong>Note:</strong></td>
<td>The fields that display on the form depend on the command you select.</td>
</tr>
<tr>
<td><strong>Source host</strong></td>
<td>Name or IP address of the server containing the files targeted by the activity.</td>
</tr>
<tr>
<td><strong>Source port</strong></td>
<td>Port number to use to communicate with the source server. The default port number is 22.</td>
</tr>
<tr>
<td><strong>Source file path</strong></td>
<td>Full path to a file (/temp/test_data_file.txt) or directory (/temp/test_dir) on a source host depending on the selected command. Field available on following commands:</td>
</tr>
<tr>
<td></td>
<td>• Copy file</td>
</tr>
<tr>
<td></td>
<td>• Remove file or directory</td>
</tr>
<tr>
<td></td>
<td>• Set file attributes</td>
</tr>
<tr>
<td><strong>Source directory</strong></td>
<td>Path to the directory where the source files are located. Field available on following commands:</td>
</tr>
<tr>
<td></td>
<td>• Create directory</td>
</tr>
<tr>
<td></td>
<td>• Get file list</td>
</tr>
<tr>
<td><strong>Source files</strong></td>
<td>Names of specific source files to include in the file transfer. Separate the file names with semi-colons. This field supports a semi-colon separated list of wild-card patterns. For example: *.txt; a?cd.pdf. If this field is blank, all files are included. Field available on following command:</td>
</tr>
<tr>
<td></td>
<td>• Get file list</td>
</tr>
<tr>
<td><strong>Note:</strong></td>
<td>For information about how the values in this field affect options in other fields, see the logic explanation which follows.</td>
</tr>
<tr>
<td><strong>Is a directory</strong></td>
<td>If checked, specifies the file path is a directory. Field available on following command:</td>
</tr>
<tr>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Credential tag for source</td>
<td>Specific credential tag this activity must use to run SFTP commands on the source host.</td>
</tr>
<tr>
<td>Credential tag for target</td>
<td>Specific credential tag this activity must use to run SFTP commands on the target host. Field available on following command:</td>
</tr>
<tr>
<td></td>
<td>• Copy file</td>
</tr>
<tr>
<td>Excluded files</td>
<td>Names of specific source files to exclude from the file transfer. The activity acts on all other files found in the source directory or subfolders. Separate the file names with commas. This field supports comma-separated list of wild-card patterns. For example: *.txt, a?cd.pdf. Field available on following command:</td>
</tr>
<tr>
<td></td>
<td>• Get file list</td>
</tr>
<tr>
<td>Note:</td>
<td>For information about how the values in this field affect options in other fields, see the logic explanation which follows.</td>
</tr>
<tr>
<td>Include subfolders</td>
<td>If checked, includes the files from subfolders in the source directory. Field available on following command:</td>
</tr>
<tr>
<td></td>
<td>• Get file list</td>
</tr>
<tr>
<td>Note:</td>
<td>For information about how your selection affects other fields in the form, see the logic explanation which follows.</td>
</tr>
<tr>
<td>Target host</td>
<td>Name or IP address of the server to which the files are being transferred. Field available on following command:</td>
</tr>
<tr>
<td></td>
<td>• Copy file</td>
</tr>
<tr>
<td>Target port</td>
<td>Port number to use to communicate with the target host. The default port number is 22. Field available on following command:</td>
</tr>
<tr>
<td></td>
<td>• Copy file</td>
</tr>
<tr>
<td>Target file path</td>
<td>Full path to a file on a target host. Field available on following commands:</td>
</tr>
<tr>
<td></td>
<td>• Copy file</td>
</tr>
<tr>
<td></td>
<td>• Rename file or directory</td>
</tr>
<tr>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| **Suffix for temporary file** | If a file exists on a target host, this command enables a temporary suffix to use for a file name. If this field contains a value, the activity first copies the source file to a temporary file on the target host using targetFilePath + tempFileSuffix as the name. Upon completion, the activity renames the file to the actual target file name. If this field is blank, the activity copies the source file directly to the target file and overwrites it, if it exists. Field available on following command:  
  - Copy file                                                                                                                       |
| **UID**                      | User ID attribute to apply to a file or directory. The UID and GID values must be set together as a pair or they are ignored. The UID and GID numbers are internal values returned by the Get File List activity. Typically, you first use the Get File List activity to return a list of files and their attributes. Then you can move a file from a source host to a target host and set the source file attributes on the target file. This flow is demonstrated in the SFTP File Transfer workflow on page 1959. Field available on following command:  
  - Set file attributes                                                                                                             |
| **GID**                      | Group ID attribute to apply to a file or directory. The UID and GID values must be set together as a pair or they are ignored. The UID and GID numbers are internal values returned by the Get File List activity. Typically, you first use the Get File List activity to return a list of files and their attributes. Then you can move a file from a source host to a target host and set the source file attributes on the target file. This flow is demonstrated in the SFTP File Transfer workflow on page 1959. Field available on following command:  
  - Set file attributes                                                                                                             |
### Option | Description
--- | ---
Permissions | File or directory permissions to set for the user and group specified. This value must be expressed as an integer, such as 16877, which defines these permissions: rwxr-xr-x. The permissions numbers are internal values returned by the Get File List activity. Typically, you first use the Get File List activity to return a list of files and their attributes. Then you can move a file from a source host to a target host and set the source file attributes on the target file. This flow is demonstrated in the *SFTP File Transfer workflow* on page 1959. Field available on following command:
- Set file attributes

Access timestamp | Override the timestamp when the file or directory was last accessed. The access and modification timestamps must be set together as a pair. Field available on following command:
- Set file attributes

Modification timestamp | Override the timestamp when the file or directory was last modified. The access and modification timestamps must be set together as a pair. Field available on following command:
- Set file attributes

Size in bytes | Size of a file, expressed in bytes. Field available on following command:
- Set file attributes

Required MID Server capabilities | MID Server with the appropriate *capabilities* for connecting to the source and target servers.

The system uses this logic to determine which files to move from the source host:
- If the Source files field is empty, the system selects all the files in the source directory. Otherwise, it only selects those files whose names match one of the file name patterns given in the field.
- If the Excluded files field is empty, the system excludes nothing. Otherwise, it excludes those files whose names match one of the file name patterns given in the field.
- The exclude rule has a higher preference than the include rule. If a file name matches one of the file name patterns in the Excluded files field, it does not get into the selection regardless of the include rule.
- When the Include subfolders check box is cleared, the system looks only in the source directory for files to include or exclude. Otherwise, it looks in the source directory and any of its subfolders for files to include or exclude.

**Note:** You can map parameter values in a test payload to variables in the Outputs tab automatically. See *automap output variables*.
• Use *auto-mapping* to generate outputs and parsing rules (recommended for JDBC)
• If you do not use auto-mapping, you can manually *create output variables* and *create parsing rules*

### SFTP template execution parameters

You use execution parameters to create the input process script in the Preprocessing form.

For descriptions of the command fields, see *Configure the SFTP execution command* on page 2078.

**Note:** You must use the *executionParam.* prefix with all variables in this table.

<table>
<thead>
<tr>
<th>Name</th>
<th>Variable</th>
<th>Type</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command</td>
<td>command</td>
<td>String</td>
<td>Identifies the function of this activity. The possible commands are:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Copy file</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Create directory</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Get file list</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Remove file or directory</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Rename file or directory</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Set file attributes</td>
</tr>
<tr>
<td>Source</td>
<td>source</td>
<td>String</td>
<td>Identifies the source host.</td>
</tr>
<tr>
<td>Source port</td>
<td>source_port</td>
<td>Integer</td>
<td>Identifies the port used to communicate with the source host.</td>
</tr>
<tr>
<td>Source directory</td>
<td>source_directory</td>
<td>String</td>
<td>Path to the source directory of the files to be moved.</td>
</tr>
<tr>
<td>Source files</td>
<td>source_files</td>
<td>String</td>
<td>Names of the files on the source to be moved.</td>
</tr>
<tr>
<td>Excluded files</td>
<td>excluded_files</td>
<td>String</td>
<td>Lists the files excluded from the operation.</td>
</tr>
<tr>
<td>Source file path</td>
<td>source_file_path</td>
<td>String</td>
<td>Path to the source files to be moved.</td>
</tr>
<tr>
<td>Target host</td>
<td>target_host</td>
<td>String</td>
<td>Identifies the target host.</td>
</tr>
<tr>
<td>Target port</td>
<td>target_port</td>
<td>Integer</td>
<td>Identifies the port used to communicate with the target host.</td>
</tr>
<tr>
<td>Name</td>
<td>Variable</td>
<td>Type</td>
<td>Usage</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------------</td>
<td>---------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Target directory</td>
<td>target_directory</td>
<td>String</td>
<td>Full path to the target directory on the target host.</td>
</tr>
<tr>
<td>Target file path</td>
<td>target_file_path</td>
<td>String</td>
<td>Full path to a file or directory on the source host or on the target host. For example, this value is used in the <em>Rename File or Directory</em> activity in the activity pack.</td>
</tr>
<tr>
<td>Temp file postfix</td>
<td>temp_file_postfix</td>
<td>String</td>
<td>Temporary file name extension used by the Copy File activity when moving a file. If this field contains an extension, the source file is copied to a temporary file using target file name + temp_file_postfix, before being renamed to the actual target file. If this field is blank, the source file is copied directly to the target file.</td>
</tr>
<tr>
<td>Is directory</td>
<td>is_directory</td>
<td>Boolean</td>
<td>Indicates whether the given file path is a directory.</td>
</tr>
<tr>
<td>Include subfolders</td>
<td>include_subfolders</td>
<td>Boolean</td>
<td>Indicates whether the system looks into subfolders of the source directory for files to include and exclude.</td>
</tr>
<tr>
<td>File attribute uid</td>
<td>file_attribute_uid</td>
<td>Integer</td>
<td>User ID associated with a file or directory.</td>
</tr>
<tr>
<td>File attribute gid</td>
<td>file_attribute_gid</td>
<td>Integer</td>
<td>Group ID associated with a file or directory.</td>
</tr>
<tr>
<td>File attribute permissions</td>
<td>file_attribute_permissions</td>
<td>Integer</td>
<td>File or directory permissions for the user and group specified.</td>
</tr>
<tr>
<td>File attribute atime</td>
<td>file_attribute_atime</td>
<td>Integer</td>
<td>Access time stamp from the file attributes.</td>
</tr>
<tr>
<td>File attribute mtime</td>
<td>file_attribute_mtime</td>
<td>Integer</td>
<td>Modification time stamp from the file attributes.</td>
</tr>
<tr>
<td>Name</td>
<td>Variable</td>
<td>Type</td>
<td>Usage</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------------</td>
<td>---------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>File attribute size</td>
<td>file_attribute_size</td>
<td>Integer</td>
<td>Size of the file, in bytes.</td>
</tr>
<tr>
<td>Source credential tag</td>
<td>source_credential_tag</td>
<td>String</td>
<td>credential alias used to run the command on the source host.</td>
</tr>
<tr>
<td>Target credential tag</td>
<td>target_credential_tag</td>
<td>String</td>
<td>Credential tag used to run the command on the target host.</td>
</tr>
<tr>
<td>MidCapabilities</td>
<td>midCapabilities</td>
<td>String (comma separated)</td>
<td>List of required MID Server capabilities.</td>
</tr>
</tbody>
</table>

**SFTP post-processing parameters and payload parsing**

Use these parameters to create a post-processing script, payload parsing, and tagging.

**Table 980: SFTP post-processing parameters**

<table>
<thead>
<tr>
<th>Name</th>
<th>Variable</th>
<th>Type</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>output</td>
<td>String</td>
<td>Contains output data returned by the query.</td>
</tr>
<tr>
<td>EccSysId</td>
<td>eccSysId</td>
<td>String</td>
<td>Contains the Reference ID associated with the ECC Queue input message.</td>
</tr>
<tr>
<td>ErrorMessages</td>
<td>errorMessages</td>
<td>String</td>
<td>Contains the error messages returned from the query. If no error messages are returned, this value is null.</td>
</tr>
<tr>
<td>Name</td>
<td>Variable</td>
<td>Type</td>
<td>Usage</td>
</tr>
<tr>
<td>--------</td>
<td>----------</td>
<td>-----------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Tags   | tags     | Hashmap of tag values returned from the SSH command | Contains the tags used to extract output using the SSH commands. The tag output is delimited by double percentage signs, as in `%%tagname%%` ... `%%`. Set up the command using the following format:  
`%%tagname1%%
output1 line 1
output1 line 2
... 
%%`
`%%tagname2%%
output2 line 1
output2 line 2
... 
%%`
The tags returned are JavaScript hashmap objects in which each key is prefixed with `tag` appended with the `tagname`.  
`{"__text__": "", "tagtagname1": "output1 line1\noutput1 line2\n", "tagtagname2": "output2 line1\noutput2 line2\n"}`

---

Configure the SFTP execution command

Use the input variables you created to configure the command that Orchestration executes on the SFTP target.

Create the input variables you need in the Inputs form before you can advance to the Execution Command stage.

Role required: activity_creator, admin

---

**Note:** You can test the JDBC connection between the MID Server and the target without having to run the activity in a workflow context. For details, see test template outputs.

---

1. Drag variables from the list of inputs and drop them into command fields. The system formats the variable in the proper syntax for the command.
2. Complete the fields shown in the table.

Figure 403: SFTP execution command
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command</td>
<td>Type of activity to create. The choices are: • Copy file • Create directory • Get file list • Remove file or directory • Rename file or directory • Set file attributes</td>
<td>All</td>
</tr>
<tr>
<td>Source host</td>
<td>Name or IP address of the server containing the files targeted by the activity.</td>
<td>All</td>
</tr>
<tr>
<td>Source port</td>
<td>Port number to use to communicate with the source server. The default port number is 22.</td>
<td>All</td>
</tr>
<tr>
<td>Source file path</td>
<td>Full path to a file on a source host.  • Copy file  • Remove file or directory  • Set file attributes</td>
<td>Get file list</td>
</tr>
<tr>
<td>Source directory</td>
<td>Path to the directory where the source files are located.  • Create directory  • Get file list</td>
<td>Get file list</td>
</tr>
<tr>
<td>Source files</td>
<td>Names of specific source files to include in the management action. Separate the file names in this list with semi-colons. This field supports the use of wild cards. If this field is blank, all files are included. For information about how the values in this field are affected by options in other fields, see the section below the table.</td>
<td>Get file list</td>
</tr>
<tr>
<td>Is a directory</td>
<td>Check box that determines if the specified file path is a directory.</td>
<td>Remove file or directory</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
<td>Command</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Credential tag for source</td>
<td>Specific <strong>credential alias</strong> this activity must use to run SFTP commands on the source host.</td>
<td>All</td>
</tr>
<tr>
<td>Credential tag for target</td>
<td>Specific credential tag this activity must use to run SFTP commands on the target host.</td>
<td>Copy file</td>
</tr>
<tr>
<td>Excluded files</td>
<td>Names of specific source files to exclude from the management action. The activity acts on all other files found in the source directory or subfolders. Separate the file names in this list with semi-colons. This field supports the use of wild cards. For information about how the values in this field are affected by options in other fields, see the section below the table.</td>
<td>Get file list</td>
</tr>
<tr>
<td>Include subfolders</td>
<td>Check box to manage the files from subfolders in the source directory. For information about how your selection affects other fields in the form, see the section below the table.</td>
<td>Get file list</td>
</tr>
<tr>
<td>Target host</td>
<td>Name or IP address of the server to which the files are being transferred.</td>
<td>Copy file</td>
</tr>
<tr>
<td>Target port</td>
<td>Port number to use to communicate with the target host. The default port number is 22.</td>
<td>Copy file</td>
</tr>
<tr>
<td>Target file path</td>
<td>Full path to a file on a target host.</td>
<td>• Copy file</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Rename file or directory</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
<td>Command</td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Suffix for temporary file</td>
<td>Temporary suffix to use for a file name if the file already exists on a target host. If this field contains a value, the activity deletes the duplicate target file if it exists, and then copies the source file to a temporary file using targetFilePath + tempFileSuffix as the name. Upon completion, the activity renames the file to the actual target file name. If this field is blank, the activity copies the source file directly to the target file and overwrites it, if it already exists.</td>
<td>Copy file</td>
</tr>
<tr>
<td>UID</td>
<td>User ID attribute to apply to a file or directory. The UID and GID values must be set together as a pair or they are ignored.</td>
<td>Set file attributes</td>
</tr>
<tr>
<td>GID</td>
<td>Group ID attribute to apply to a file or directory. The UID and GID values must be set together as a pair or they are ignored.</td>
<td>Set file attributes</td>
</tr>
<tr>
<td>Permissions</td>
<td>File or directory permissions to set for the user and group specified. This value must be expressed as an integer, such as 16877, which defines these permissions: rwxr-xr-x. The permissions number is an internal value returned by the Get File List activity. Typically, you first use the Get File List activity to return a list of files and their attributes. Then you can move a file from a source host to a target host and set the source file attributes on the target file. This is demonstrated in the SFTP File Transfer workflow on page 1959.</td>
<td>Set file attributes</td>
</tr>
</tbody>
</table>
Field | Description | Command
--- | --- | ---
Access timestamp | Override the timestamp when the file or directory was last accessed. The access and modification timestamps must be set together as a pair. | Set file attributes
Modification timestamp | Override the timestamp when the file or directory was last modified. The access and modification timestamps must be set together as a pair. | Set file attributes
Size in bytes | Size of a file, expressed in bytes. | Set file attributes
Required MID Server capabilities | MID Server with the appropriate capabilities for connecting to the source and target servers. By default, the system selects an SSH MID Server. | All

The system uses this logic to determine which files to move from the source host:

- If the Source files field is empty, the system select all the files in the source directory. Otherwise, it only selects those files whose names match one of the file name patterns given in the field.
- If the Excluded files field is empty, the system excludes nothing. Otherwise, it excludes those files whose names match one of the file name patterns given in the field.
- The exclude rule has a higher preference than the include rule. A file whose name matches one of the file name patterns in the Excluded files field does not get into the selection, even though it would be selected by the include rule.
- When the Include subfolders check box is cleared, the system looks only in the source directory for files to include or exclude. Otherwise, it looks in the source directory and any of its subfolders for files to include or exclude.

3. Click Save.
4. Click Continue to advance to the Outputs stage.

Create a probe activity
Create an activity that runs a probe on the target host that is configured to return specific information..

Role required: activity_creator or workflow_admin

For instructions on using the activity template process flow, see create custom activities.

1. Create a custom activity.
   This action creates a custom activity using a template.
2. After setting up general properties and creating input variables, configure the Probe Execution Command:
<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Map the input variables</td>
<td>Use the variables you created to configure the command that Orchestration executes.</td>
</tr>
<tr>
<td>Probe</td>
<td>Probe to run with this activity, from the list of probes in the system</td>
</tr>
<tr>
<td>Target host</td>
<td>Host name or IP address of the target server for this activity.</td>
</tr>
<tr>
<td>Parameters</td>
<td>MID Server to use, by capabilities.</td>
</tr>
<tr>
<td>Required MID Server capabilities</td>
<td>Name-value pairs to pass to the host with this probe. You can create these parameters manually, or drag and drop input variables into the parameter fields and assign a value.</td>
</tr>
</tbody>
</table>

**Note:** You can map parameter values in a test payload to variables in the Outputs tab automatically. See [automap output variables](#).

- Use auto-mapping to generate outputs and parsing rules
- If you do not use auto-mapping, you can manually create output variables and create parsing rules

**Probe template execution parameters**
You use execution parameters to create the input process script in the Pre Processing form.

For descriptions of the command fields, see [Configure the Probe execution command](#) on page 2086.

**Note:** You must use the executionParam. prefix with all variables in this table.

### Table 982: Probe activity execution parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Variable</th>
<th>Type</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probe</td>
<td>probe</td>
<td>Reference</td>
<td>The sys_id of the MID Server probe.</td>
</tr>
<tr>
<td>Source</td>
<td>source</td>
<td>String</td>
<td>Intended target host</td>
</tr>
<tr>
<td>Name</td>
<td>Variable</td>
<td>Type</td>
<td>Usage</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------</td>
<td>-------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Parameters       | parameters    | Array of JS object      | Array of JavaScript objects, expressed with the executionParam. prefix. To add more name-value pairs to the parameters array, append them to the existing array. Create a JavaScript object with the following syntax, and add it to the executionParam.parameters array. This assigns additional parameters to the message:  
  ```javascript
  var newParameter = {
    "name": "parameterName",
    "value": "parameterValue"
  };
  executionParam.parameters.push(newParameter);
  ``` |
| MidCapabilities  | midCapabilities | String (comma separated) | List of required MID server capabilities. |
| ValueCapabilities| valueCapabilities | Array of hashmap | Capability values used to select the MID Server. For more information, see MID Server capabilities on page 1716. If there are additional capabilities that are assigned by value, use this example to customize the MID Server selection:  
  ```javascript
  var valueCapability = {
    'NEW_MID_CAPABILITY': 'NEW_MID_CAPABILITY_VALUE'
  };
  executionParam.valueCapabilities.push(valueCapability);
  ``` |

**Probe template post-processing parameters**

Use these parameters to create a post-processing script.

**Table 983: Probe post-processing parameters**

<table>
<thead>
<tr>
<th>Name</th>
<th>Variable</th>
<th>Type</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Payload</td>
<td>payload</td>
<td>String</td>
<td>Contains raw payload returned from the probe.</td>
</tr>
<tr>
<td>Output</td>
<td>output</td>
<td>String</td>
<td>Contains output data returned from the probe.</td>
</tr>
<tr>
<td>Name</td>
<td>Variable</td>
<td>Type</td>
<td>Usage</td>
</tr>
<tr>
<td>--------</td>
<td>----------</td>
<td>-------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>EccSysId</td>
<td>eccSysId</td>
<td>String</td>
<td>Contains the reference ID associated with the ECC Queue input message.</td>
</tr>
</tbody>
</table>

**Configure the Probe execution command**

Use the input variables you created to configure the command that Orchestration executes on the target.

Create the input variables you need in the Inputs form before you can advance to the Execution Command stage.

Role required: activity_creator, admin

**Note:** You can test the activity connection between the MID Server and the target without having to run the activity in a workflow context. For details, see [test template outputs](#).

1. Drag variables from the list of inputs and drop them into command fields. The system formats the variable in the proper syntax for the command.
Figure 404: Probe execution command

2. Complete the fields shown in the table.
Table 984: Probe execution command fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>Input variable builder. [Create input variables](page 2000) to map to available fields.</td>
</tr>
<tr>
<td>Probe</td>
<td>Probe to run with this activity, from the list of probes in the system.</td>
</tr>
<tr>
<td>Target host</td>
<td>Host name or IP address of the target server for this activity.</td>
</tr>
<tr>
<td>Required MID Server capabilities</td>
<td>MID Server to use, by capabilities.</td>
</tr>
<tr>
<td>Parameters</td>
<td>Name-value pairs to pass to the host with this probe. You can create these parameters manually, or drag and drop input variables into the parameter fields and assign a value.</td>
</tr>
</tbody>
</table>

3. Click Save.  
4. Click Continue to advance to the Outputs stage.

Create an SSH activity

Create an activity that extracts data from a target host that uses the SSH network protocol.  
Role required: activity_creator or workflow_admin  
For instructions on using the activity template process flow, see [create custom activities](create custom activities).

1. Create a [custom activity]. This action creates a custom activity using a template.  
2. After setting up [general properties] and [creating input variables], configure the SSH Execution Command:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Map the input variables</strong></td>
<td>Use the variables you created to configure the command that Orchestration executes.</td>
</tr>
<tr>
<td>Target host</td>
<td>Host name or IP address of the target server for this activity.</td>
</tr>
<tr>
<td>Command</td>
<td>Command this activity runs on the target host. You can invoke a MID Server script from this field using any script type that the SSH command line supports. For more information, see Advanced SSH script options below the table.</td>
</tr>
<tr>
<td>Directory</td>
<td>Directory on the target host where the command is run.</td>
</tr>
<tr>
<td>Credential tag</td>
<td>The Orchestration credential tag to use when running the command.</td>
</tr>
<tr>
<td>Required MID Server capabilities</td>
<td>MID Server with the appropriate capabilities for connecting to the host. By default, the system selects a MID Server with SSH capabilities.</td>
</tr>
</tbody>
</table>
Option | Description
---|---
**Long running** | If checked, disables the SSH connection timeout for commands that might take longer to run than the default 60 seconds. Orchestration periodically checks the running process to determine its status until it is finished.

**Must Sudo** | If checked, enables the use of `sudo` to run commands.

**Note:** You can map parameter values in a test payload to variables in the Outputs tab automatically. See [automap output variables](#).

- Use **auto-mapping** to generate outputs and parsing rules
- If you do not use auto-mapping, you can manually [create output variables](#) and [create parsing rules](#)

**SSH template execution parameters**
Use execution parameters to create the input process script in the Pre Processing form of the activity designer.

For descriptions of the command fields, see [*Configure the SSH execution command*](#) on page 2091.

**Note:** You must use the `executionParam` prefix with all variables in this table.

### Table 985: SSH execution parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Variable</th>
<th>Type</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
<td>source</td>
<td>String</td>
<td>Intended target or host.</td>
</tr>
<tr>
<td>Command</td>
<td>command</td>
<td>String</td>
<td>Comment to run on the host.</td>
</tr>
<tr>
<td>Directory</td>
<td>directory</td>
<td>String</td>
<td>Directory on the host in which to run the command.</td>
</tr>
<tr>
<td>Credential tag</td>
<td>credential_tag</td>
<td>String</td>
<td>Orchestration credential tag to use when running the command.</td>
</tr>
<tr>
<td>MidCapabilities</td>
<td>midCapabilities</td>
<td>String (comma separated)</td>
<td>List of required MID Server capabilities.</td>
</tr>
</tbody>
</table>

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### London ServiceNow Now Platform Capabilities

<table>
<thead>
<tr>
<th>Name</th>
<th>Variable</th>
<th>Type</th>
<th>Usage</th>
</tr>
</thead>
</table>
| ValueCapabilities   | valueCapabilities | Array of hashmap | Capability values used to select the MID Server. For more information, see [MID Server capabilities](#) on page 1716. If there are additional capabilities that are assigned by value, use this example to customize the MID Server selection:  

```javascript
var valueCapability = {
  'NEW_MID_CAPABILITY': 'NEW_MID_CAPABILITY_VALUE';
};
executionParam.valueCapabilities.push(valueCapability);
```

<table>
<thead>
<tr>
<th>Name</th>
<th>Variable</th>
<th>Type</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long running</td>
<td>long_running</td>
<td>Boolean</td>
<td>Indicates whether or not the command is long running. A value of true indicates that the command is long running.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Variable</th>
<th>Type</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Must sudo</td>
<td>must_sudo</td>
<td>Boolean</td>
<td>Indicates whether or not this activity must use sudo to run root commands. A value of true indicates that sudo must be used.</td>
</tr>
</tbody>
</table>

**SSH post-processing parameters and payload parsing**

Use these parameters to create a post-processing script, payload parsing, and tagging.

#### Table 986: SSH post-processing parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Variable</th>
<th>Type</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>output</td>
<td>String</td>
<td>Contains the output returned from the SSH command.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Variable</th>
<th>Type</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>EccSysID</td>
<td>eccSysID</td>
<td>String</td>
<td>Contains the reference ID associated with the ECC Queue input message returned by the activity.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Variable</th>
<th>Type</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>ErrorMessages</td>
<td>errorMessages</td>
<td>String</td>
<td>Contains the error messages retrieved from the SSH command. This value is null if there are no error messages.</td>
</tr>
<tr>
<td>Name</td>
<td>Variable</td>
<td>Type</td>
<td>Usage</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
<td>------</td>
<td>-------</td>
</tr>
</tbody>
</table>
| Tags | tags     | Hashmap of tag values returned from the SSH command | Contains the tags used to extract output using the SSH commands. The tag output is delimited by double percentage signs, as in `%%tagname%% ... %`. Set up the command using the following format:  
`%%tagname1%%
output1 line 1
output1 line 2
...
%%

`%%tagname2%%
output2 line 1
output2 line 2
...
%%`

The tags returned are JavaScript hashmap objects in which each key is prefixed with tag appended with the tagname.  
`{"__text__": ",
"tagtagname1":"output1
line1
output1
line2\n",
"tagtagname2":"output2
line1
output2
line2\n"}`

---

**Configure the SSH execution command**

Use the input variables you created to configure the command that Orchestration executes on the host target.

Create the input variables you need in the Inputs form before you advance to the Execution Command stage.

Role required: activity_creator, admin

---

**Note:** You can test the SSH connection between the MID Server and the target without having to run the activity in a workflow context. For details, see test template outputs.

---

1. Drag variables from the list of inputs and drop them into command fields. The system formats the variable in the proper syntax for the command.
2. Complete the fields shown in the table.

Figure 405: SSH execution command
### Table 987: SSH activity inputs

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>Input variable builder. <em>Create input variables</em> on page 2000 to map to available fields.</td>
</tr>
<tr>
<td>Target host</td>
<td>Host name or IP address of the target server for this activity.</td>
</tr>
<tr>
<td>Command</td>
<td>Command this activity runs on the target host. You can invoke a MID Server script from this field using any script type that is supported by the SSH command line. For more information, see Advanced SSH script options below the table.</td>
</tr>
<tr>
<td>Directory</td>
<td>Directory on the target host where the command is run.</td>
</tr>
<tr>
<td>Credential tag</td>
<td>The credential alias to use when running the command.</td>
</tr>
<tr>
<td>Select MID Server by capabilities</td>
<td>MID Server with the appropriate capabilities for connecting to the host. By default, the system selects a MID Server with SSH capabilities</td>
</tr>
<tr>
<td>Long running</td>
<td>Check box to disable the SSH connection timeout for commands that might take longer to run than the default 60 seconds. Orchestration periodically checks the running process to determine its status until it is finished.</td>
</tr>
<tr>
<td>Must Sudo</td>
<td>Check box to allow the use of <em>sudo</em> to run commands.</td>
</tr>
</tbody>
</table>

3. Click Save.  
4. Click Continue to advance to the Outputs stage.

**Create a run script activity**

Create an activity that runs any script.  
Role required: activity_creator or workflow_admin  

1. Create a *custom activity*.  
   This action creates a custom activity using a template.  
2. After setting up *general properties* and *creating input variables*, configure the Run Script Execution Command:  
   Create a script for this activity to execute.

**Note:** You can map parameter values in a test payload to variables in the Outputs tab automatically. See *automap output variables*. 

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• Use auto-mapping to generate outputs and parsing rules
• If you do not use auto-mapping, you can manually create output variables and create parsing rules

*Run Script template processing script*
Use the Run Script custom template Script form to enter a script to call and use with other activities.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processing script</td>
<td>Script that the activity runs.</td>
</tr>
<tr>
<td>Variables</td>
<td>Input variables that are available to use as building blocks in the input process script. Click the arrow above the field to open the variables list. Click an item in the tree to add it to your script in the appropriate syntax. The list displays input variables you passed into the activity on the Inputs form. All activity variables added in the Inputs form are read-only and are expressed in the processing script with this syntax: activityInput-variable.</td>
</tr>
</tbody>
</table>

*Create a JMS activity*
Create a custom JMS activity to retrieve or send messages to external systems using the Java Messaging Service.

Role required: activity_creator or workflow_admin

The JMS activity supports third party JMS providers whose JMS client application is written with a typical Java EE pattern and can support these operations:

• Using JNDI to find a ConnectionFactory object.
• Using JNDI to find one or more destination objects.
• Using the ConnectionFactory to create a JMS connection object.
• Using the JMS connection to create one or more JMS session objects.
• Using a JMS session and the destinations to create the MessageProducer and MessageConsumer objects.
• Starting the JMS connection to enable delivery or consumption of messages.

*Note:* The JMS activity designer has been tested with the JMS providers ActiveMQ and Tibco EMS. When connecting to a JMS provider, refer to your third party user documentation.

1. Create or verify your JMS credential.
   Your JMS credentials must have permission for the target database and proper configuration for the corresponding JMS connection. Credentials must be set up before you can create a JMS activity.

2. Create or verify your JMS connection.
   Your JMS connection must be configured with valid JMS credentials set up before you can create a JMS activity.

3. Create a custom activity.
   This action creates a custom activity using a template.

4. After setting up general properties and creating input variables, configure the JMS Execution Command:
<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configure your credential</td>
<td>Fill in the fields necessary for your database connection.</td>
</tr>
<tr>
<td>Connection Factory</td>
<td>Name of the JMS Connection Factory. You should create or verify your JMS connection. This configuration links the name of the Initial Context Factory with the URL of the JMS provider.</td>
</tr>
<tr>
<td>Destination Type</td>
<td>Type of destination used for this message:</td>
</tr>
<tr>
<td></td>
<td>• Queue: Message is queued for point-to-point communications.</td>
</tr>
<tr>
<td></td>
<td>Note: The GET operation is only supported for the Queue destination type.</td>
</tr>
<tr>
<td></td>
<td>• Topic: Message is used for publish and subscribe communication.</td>
</tr>
<tr>
<td>Destination Name</td>
<td>Name of the queue or topic destination that is configured on the JMS provider.</td>
</tr>
<tr>
<td>Message Type</td>
<td>The JMS message type value. Only the Text Message type is supported. The queue or topic destination must be configured to receive or send only Text Message. Other message types are dropped, since the JMS Activity cannot process them.</td>
</tr>
<tr>
<td>Operation</td>
<td>The programmatic operation to perform on the destination. The choices are PUT or GET.</td>
</tr>
<tr>
<td>Timeout (Secs)</td>
<td>Allowed time to wait for a message in the message queue before it times out, in seconds. The default is 30.</td>
</tr>
<tr>
<td>Custom message headers</td>
<td>The custom header values in a name/value pair format, that is available on the JMS destination.</td>
</tr>
<tr>
<td>Message payload</td>
<td>Actual message content or payload that is sent to the JMS destination.</td>
</tr>
<tr>
<td>Credential tag</td>
<td>A tag for an individual credential for a JMS activity in an Orchestration workflow.</td>
</tr>
<tr>
<td>Required MID Server capabilities</td>
<td>MID Server to use, by capabilities.</td>
</tr>
</tbody>
</table>

- Use auto-mapping to generate outputs and parsing rules
- If you do not use auto-mapping, you can manually create output variables and create parsing rules
Create a JMS connection for an Orchestration activity
Configure your system to use Java Messaging Service (JMS) with a custom Orchestration JMS activity.

Role required: admin

The MID Server must have the correct JMS connection factories for your organization. Configure those values in the mid.property.jms.command.allowed_factory_names property, found in MID Server Properties. The default values for this property can be changed to any value or comma-separated list of values that the third-party JMS provider advertises.

1. Navigate to MID Server JAR Files.
2. Click New and add:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>A unique and descriptive name for identifying the file in the instance.</td>
</tr>
<tr>
<td>Version</td>
<td>A version number for the file, if one is available.</td>
</tr>
<tr>
<td>Source</td>
<td>Location of the JAR file for reference purposes. Source information is not used by the system.</td>
</tr>
<tr>
<td>Description</td>
<td>Short description of the JAR file and its purpose in the instance.</td>
</tr>
</tbody>
</table>

3. Click the paper clip icon in the banner and attach the JMS driver jar file.
The JMS driver jar file should be available as part of JMS provider installation. Few JMS vendors make them available as a separate product. Refer to the JMS provider documentation to determine which JMS client driver jar files require the client applications to connect to the JMS provider. For example, if you are trying to connect to ActiveMQ V5.10 (JMS provider), you need the activemq-all-5.10.1.jar file.

5. Click New, add the following, and click Submit:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Unique name of this connection factory.</td>
</tr>
<tr>
<td>Initial Context Factory</td>
<td>Name of the JNDI class that is used to create the InitialContext.</td>
</tr>
</tbody>
</table>

**Note:** For example, to connect to ActiveMQ V5.10 (JMS Provider), the value is org.apache.activemq.jndi.ActiveMQInitialContextFactory.

<table>
<thead>
<tr>
<th>Provider URL</th>
<th>Location of the running JMS provider installation.</th>
</tr>
</thead>
</table>

**Note:** For example, to connect to ActiveMQ V5.1: tcp://ipAddressOrHostName:61616.

6. Navigate to Orchestration Credentials.
7. Click New, select JMS Credentials, and provide the user name and password the MID should use to communicate with the JMS provider.
   For more information, see JMS credentials.
8. Click Submit.
   You are ready to create a custom JMS activity.
**JMS template execution parameters**

You use execution parameters to create the input process script in the Preprocessing form. You must use the executionParam. prefix with all variables in this table.

<table>
<thead>
<tr>
<th>Name</th>
<th>Variable</th>
<th>Type</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jms ds</td>
<td>jms_ds</td>
<td>Reference</td>
<td>Selected JMS data source.</td>
</tr>
<tr>
<td>Destination type</td>
<td>destination_type</td>
<td>Enumerated</td>
<td></td>
</tr>
<tr>
<td>Destination name</td>
<td>destination_name</td>
<td>String</td>
<td></td>
</tr>
<tr>
<td>Message type</td>
<td>message_type</td>
<td>Enumerated</td>
<td></td>
</tr>
<tr>
<td>Operation</td>
<td>operation</td>
<td>Enumerated</td>
<td></td>
</tr>
<tr>
<td>Time out</td>
<td>time_out</td>
<td>Integer</td>
<td>Length of time to wait for the query to return results.</td>
</tr>
<tr>
<td>Custom headers</td>
<td>custom_headers</td>
<td>Array of JavaScript objects</td>
<td></td>
</tr>
<tr>
<td>Message payload</td>
<td>message_payload</td>
<td>String</td>
<td></td>
</tr>
<tr>
<td>Credential tag</td>
<td>credential_tag</td>
<td>String</td>
<td>List of required MID Server capabilities.</td>
</tr>
<tr>
<td>MidCapabilities</td>
<td>midCapabilities</td>
<td>String (comma separated)</td>
<td></td>
</tr>
<tr>
<td>ValueCapabilities</td>
<td>valueCapabilities</td>
<td>Array of hashmap</td>
<td>Capability values used to select the MID Server. For more information, see MID Server capabilities on page 1716. If there are additional capabilities that are assigned by value, use this example to customize the MID Server selection:</td>
</tr>
</tbody>
</table>

```javascript
var valueCapability = {'NEW_MID_CAPABILITY': 'NEW_MID_CAPABILITY_VALUE'};
executionParam.valueCapabilities.push(valueCapability);
```

**JMS template post-processing parameters**

Use these parameters to create a post-processing script.
## Table 990: JMS post-processing parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Variable</th>
<th>Type</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>status</td>
<td>String</td>
<td>Status of the operation (Put or Get) on the JMS destination.</td>
</tr>
<tr>
<td>StandardHeaders</td>
<td>standardHeaders</td>
<td>String</td>
<td>All the standard headers, as specified by JMS, that are obtained as part of the JMS message during a Get operation. This field is applicable only for Get operations.</td>
</tr>
<tr>
<td>CustomHeaders</td>
<td>customHeaders</td>
<td>String</td>
<td>All custom headers added by a producer or publisher application that are obtained as part of the JMS message during a Get operation. This field is applicable only for Get operations.</td>
</tr>
<tr>
<td>MessagePayload</td>
<td>messagePayload</td>
<td>String</td>
<td>Message payload that is obtained as part of the JMS message during a Get operation. This field is applicable only for Get operations.</td>
</tr>
<tr>
<td>EccSysID</td>
<td>eccSysID</td>
<td>String</td>
<td>Contains the reference ID associated with the ECC Queue input message returned by the activity.</td>
</tr>
<tr>
<td>ErrorMessages</td>
<td>errorMessages</td>
<td>String</td>
<td>Contains any error messages retrieved from the JMS command. This value is null if there are no error messages.</td>
</tr>
</tbody>
</table>

### Activity scoping

Custom activities run in their own scope, even if it is different from that of the workflow.

Any script that runs inside a custom activity with a scope can only access outside artifacts that are within the scope of that activity or artifacts that are configured to run in any scope. Conversely, an outside artifact can only access the script inside that private activity if the outside artifact is running in the same scope. Activities with public scopes can interact with outside artifacts in any application scope.

You can use private activities as part of a workflow that has a public application scope. These activities are protected from reaching outside of the workflow or from being reached from outside the workflow.
For details about setting application scoping for custom activities, see the field description table for the appropriate activity template.

**Note:** Custom activities uploaded to the ServiceNow Store must be configured as accessible to all application scopes.

---

## Publish a custom activity

When a user creates a custom activity and saves or submits it, that activity appears in the Custom and Packs tabs of the designer palette, but is visible only to the user who created it.

Roles required: admin, activity_admin, activity_creator

1. When you finish configuring the activity, click Publish. This makes the activity accessible to other users on the instance with the workflow_admin or activity_creator role. Published activities are available for upload to the ServiceNow Store, can be added to workflows, and can be edited by any user with the proper roles.

2. To edit a published activity, click Checkout. When an activity is checked out by a user, only that user can modify it. The fields of a checked out activity are read-only for all other users.

3. When you are finished editing the checked out activity, publish it again. The system adds a new version of this activity to the Custom tab in the Workflow Editor palette.

**Note:** Activities you create and publish are visible in the Packs tab only if they were created in the current application scope.

---

## Return a locked activity to a published state

Problems can arise if an activity version is checked out by a user and not checked back in. An activity in this state cannot be checked out for update.

Role required: admin, activity_admin, activity_creator

An administrator can return a locked activity to a published state.

1. Open the Workflow Editor.
2. From the Custom tab, open the activity that is locked.
3. Click the menu icon in the title bar and select Versions from the context menu. A list of all the versions of that activity appears. The locked version displays the user who checked it out.
4. Select the checked out version.
   The system opens the record in the activity designer.
5. Click the menu icon again and select Force Checkout from the context menu.
   The activity fields become editable.
6. Click Publish.
   The activity becomes available to users with the appropriate roles.

Copy a custom activity

You can copy activities for reuse from the Custom tab in the global scope.

Role required: admin, activity_admin, activity_creator

**Note:** You cannot copy an activity in a private scope.

1. To reuse an activity in the global scope, expand the parent category to display the activities.
2. Right-click the activity you want to copy and select one of these options:
   - Copy into global scope as new activity: Copies the activity with the new name you provide, uses the same version number as the original activity, and moves it to the global scope in the Custom tab.
Figure 406: Naming an activity copy

- Copy into global scope as new version: Copies the activity using the same name, increments the version number, and moves it to the global scope in the Custom tab. The system automatically adds the parent category to the Custom tab if it does not already exist. This action will overwrite another activity with the same name and version number.

Figure 407: Creating a new activity version

---

**Note:** If the activity is in any other scope but global, the system displays this message: Cannot copy privately scoped activity.

---

**Orchestration databus**

The databus allows workflow designers to track the flow of data through an Orchestration workflow and provides access to output data that can be consumed by other custom activities.

Data is made available in a workflow when you use activities created with the *Orchestration activity designer* on page 1990. The activity designer provides the ability to specify well defined inputs and outputs for your activities. When you use those activities on the workflow canvas, the outputs appear in the Data tab and are available for use as inputs in subsequent activities.

---

**Note:** Orchestration does not filter the data you are given for reuse in the Data tab. You must make sure an activity in the workflow canvas has executed before you consume its output data.

---

When you drop a custom activity onto the workflow canvas, the system assigns it an index. If you delete an activity from the canvas and add a new one, the indexes are not reused. This ensures that you don't accidentally start subscribing to data you did not intend to use. If you update an activity in the activity designer, the system automatically updates the activity on the canvas to ensure the data you are subscribing to downstream is not affected.
Reuse data in the activity designer

The Data tab in the Workflow Editor lists all custom activities used in the current workflow that produce data and displays that data for reuse in other custom activities.

Roles required: workflow_creator

Activities are categorized by application in this tab and are available for use as data sources for other activities. The Data tab is a graphical representation of the workflow Databus, which manages all the temporary data used by the current workflow.

1. Drag output variables from an activity in this tab into the inputs of another activity on the workflow canvas to link the activities together.

   You can use any of the outputs in the structure, regardless of the the application to which they belong. An index number in parenthesis after the activity name provides a unique identifier for the parameters that you use as input data in other activities. If you do not name a custom activity, the only identifier for that activity in the Data tab is the index number. Index numbers indicate the sequence in which custom activities were added to the workflow and are not reused. When you drag a custom activity onto the workflow canvas, the system adds that activity and its output data to the structure. Conversely, if you remove a custom activity from the canvas, that activity and its outputs disappear from the data list.

2. Point to an activity to display information about it in a pop-up window.

   Any output data reused by the activity is listed in the Databus Output field of the the pop-up window.
MID Servers for Orchestration

Orchestration automatically selects an appropriate MID Server based on the capabilities that you configure in activities, the IP addresses of target devices, and the application that the MID Server is allowed to use.

To allow a MID Server to work with Orchestration, it must have the Orchestration application or the ALL application assigned to it. See Configure a default MID Server for each application on page 1633 for instructions.

You can have MID Servers focus on different capabilities and separate sections of your network. See:

- MID Server capabilities on page 1716
- Map an IP address to a DNS name on page 1682

You can also specify a default MID Server to use if no MID Servers meet the capability and IP range criteria for an activity. See Select the default MID Server for Orchestration.

MID Server capabilities

MID Server capabilities define the specific functions of a MID Server within an IP address range.

Several applications, such as Discovery, Service Mapping, Cloud Management, and Orchestration can use capabilities, IP ranges, and MID Server selection on page 1630 to narrow the pool of MID Servers the applications need.

**Note:** At least one capability is required for each MID Server used by Orchestration. See MID Servers for Orchestration on page 2103 for more information.
The following capabilities are available by default with Discovery:

- All
- Cloud Management
- Nmap
- PowerShell
- Resolve DNS
- REST
- SNMP
- SOAP
- SSH
- VMware
- WMI

**Nmap capability**

The Nmap capability is only assigned to MID Servers for which the Network Mapper (Nmap) scanner has been installed for *credential-less Discovery*. This capability cannot be added to or removed from any MID Server manually. For instructions on installing or uninstalling Nmap, see *Install and uninstall Nmap on a MID Server* on page 1694

**MID Server capability values**

Capabilities provided in the base system do not have a defined value string. A MID Server configured to use a capability that has no value can locate any device using that capability's protocol. If a capability has a defined value, the MID Server using that capability finds only those devices using that protocol that match the value string exactly. The exception to this is the Resolve DNS capability, which is configured to resolve any DNS name into an IP address using a partial string match.

Starting with the London release, the [capability name]:[value] combination appears in the slushbucket when you add a capability to a MID Server. This combination allows you to see all the capabilities that have different values, even if the capability name is the same. For example, if you are using the Cloud Management capability, and you use the value field to specify the us-west logical datacenter on one of the capability records, you can see the combination in the Collection list.
Scripted MID Server capability value matching

You can use value tests to create capabilities that find devices using values without requiring exact string matching. Action on these values is controlled by a user-defined script.

The Resolve DNS capability is provided in the base system and is configured to resolve DNS names into IP addresses for devices whose names end with a specified domain name. The capability Value entered is automatically prefaced with a dot during processing to match domain syntax. This value can contain one or more sub-domains, but must include the end of the domain string. Matching devices must end with the identical syntax. The script for the Resolve DNS capability determines if a device name matches the criteria defined by Value. If a match exists, the platform performs the address resolution automatically. For example, if the value for the Resolve DNS capability is service-now.com, the MID Server with this capability finds lnxlab01.sandiego.service-now.com and dbsrv101.sanjose.service-now.com. If the value is changed to sandiego.service-now.com, then the MID Server finds only lnxlab01.

Note: If Value in the Resolve DNS capability is blank, then all domains match.

To view the script for evaluating this capability, navigate to MID Server Capability Value Tests and select Resolve DNS from the list.
Configure MID Server capabilities

A capability is required for each MID Server to work with Orchestration, Cloud Management, Service Mapping, and alert aggregation and RCA.

Role required: admin or sm_admin

1. Navigate to MID Server Capabilities.
2. Select an existing capability. You can also select ALL to include all capabilities.

   **Note:** Ensure that each IP address range has MID Servers with the necessary capabilities to complete the Orchestration activities on that network segment.

3. Create a new capability:
   a) Click New.
   b) Configure the value for a custom capability. An example is a capability for DOMAIN, with a value of service-now.
   c) Click Submit.

4. Click Edit in the MID Servers related list to add MID Servers to the capability.
5. Select one or more MID Servers for this capability from the slushbucket.
6. Click Save.

   The capability defined here also appears in the primary record for this MID Server.

**Select the default MID Server for Orchestration**

Orchestration uses the default MID Server if it cannot find a MID Server with the correct IP range and capability.

Specify the default MID Server in either of these locations:

- The Default MID Server field on the Orchestration application record. See *Configure a default MID Server for each application* on page 1633 for instructions.
- The Default MID Server to use for Orchestration Activities property. Navigate to Orchestration MID Server Properties to set this value.

These two values are automatically kept in synch. You can change the default MID Server in either location.

**PowerShell probe version 2 system property**

View detailed PowerShell credential information and view extended logging information.

Starting with the london release, there is a new system property for the PowerShell probe which enables the version 2 of the probe. This new version enables you to view detailed credential information on why PowerShell credentials fail or succeed. You can also view logging information for an ECC Queue payload and Workflow Context log.

```
mid.server.rba_powershell_v2
```

Enables the PowerShell probe version 2 for use with all PowerShell activities. The default value is true. If you choose false, the legacy PowerShell probe is used. Unless there are issues, use version 2, as the legacy version is going to be deprecated.

**Note:** This property only applies to Orchestration activities. Discovery probes are not affected.

You can access the property by selecting the MID Server Properties link in the navigation pane:
PowerShell log property

Enable debug messages to display from PowerShell.

This property enables control of when and where to display debug messages generated by debug statements embedded in the PowerShell scripts.

mid.property.powershell.log_info

The new MID Server PowerShell log property:

- Displays logging information.

Note: Once logging is enabled, OOB PowerShell scripts log information.

- Adds logging information to your developed PowerShell scripts and PowerShell activities.

Note: Logging information is only available when property is enabled.

- Logging is not enabled by default.

If the property is set to true, debug messages display from the workflow context or from the Response popup after you test inputs. The ecc_queue entry payload for each of the PowerShell activities is going to show all the debug messages that were logged.

Enable the PowerShell log property for each MID Server. If the MID Server field is empty, the property applies to all MID Servers. There are separate credential debug messages that always come back regardless of this setting. The credential debug messages show which credentials have been used and other related information.
Use the Orchestration Usage dashboard

This dashboard shows an overview of Orchestration usage metrics to show customers how their organization uses Orchestration and to support license compliance.

Role required: orchestration_manager

1. To view the dashboard, navigate to Orchestration Operations & Troubleshooting Orchestration Usage Dashboard.

   The Orchestration Usage dashboard displays. The tabs on the dashboard include Licensable Usage and Orchestration Usage. Reports on these tabs include:

   **Table 991: Orchestration Usage Metrics**

<table>
<thead>
<tr>
<th>Metric</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transaction Summary Last 12 months</td>
<td>A running transaction count of all Orchestration transactions over the last 12 months. Includes:</td>
</tr>
<tr>
<td></td>
<td>• The count of orchestration transactions associated with the HR Application</td>
</tr>
<tr>
<td></td>
<td>• The count of Orchestration transactions associated with the Security Operations Application</td>
</tr>
<tr>
<td>Transaction Summary YTD</td>
<td>Cumulative count of all transactions since the time the Orchestration plugin was activated or the customer upgraded to Geneva.</td>
</tr>
<tr>
<td>365 day Running Average of Server</td>
<td>The running average over the last 365 days for cmdb_ci_computer - cmdb_ci_server. This includes all physical and virtual client nodes and excludes server nodes from the count.</td>
</tr>
<tr>
<td>365 day Running Average of Client</td>
<td>The running average over the last 365 days for cmdb_ci_server. This includes all physical and virtual server nodes.</td>
</tr>
<tr>
<td>Orchestration Transactions by Month for</td>
<td></td>
</tr>
<tr>
<td>Last 12 Months</td>
<td></td>
</tr>
<tr>
<td>Average Client Nodes Orchestrated Last</td>
<td></td>
</tr>
<tr>
<td>365 Days</td>
<td></td>
</tr>
<tr>
<td>Average Server Nodes Orchestrated Last</td>
<td></td>
</tr>
<tr>
<td>365 Days</td>
<td></td>
</tr>
<tr>
<td>Metric</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Number of Orchestration Activities Developed Last 365 Days</td>
<td>The aggregate number of activity definitions you have developed and OOB activity definitions you have modified. This number includes activity elements (Activities build with the Activity Designer) you have developed and OOB activity definitions you have modified. Note: his number excludes activity elements that are shipped with ServiceNow Applications that use the Orchestration Runtime e.g. ServiceNow Security Operations and Human Resources Apps.</td>
</tr>
<tr>
<td>Cumulative Client Nodes Orchestrated by Month</td>
<td></td>
</tr>
<tr>
<td>Cumulative Server Nodes Orchestrated by Month</td>
<td></td>
</tr>
<tr>
<td>Usage by Provider Last 12 Months</td>
<td>Breaks down emphasis by provider, such as PowerShell, JDBC, SSH, etc.</td>
</tr>
<tr>
<td>Top 10 Orchestration Activities</td>
<td></td>
</tr>
</tbody>
</table>

2. You can add more widgets to the dashboard by clicking the Add Content icon (+) in the upper right corner of the dashboard.

Note: You should not modify the first tab in this Dashboard. If you want a different dashboard experience, add a tab and customize that with your usage reports.

Password Reset application

The ServiceNow® Password Reset application enables an end user to use a self-service process to reset or change the password. Alternatively, your organization can implement a process that requires a service desk agent to reset passwords for end users.

Explore
- Password Reset release notes
- Upgrade to London

Set up
- Password Reset setup guide on page 2111

Administer
- Password Reset admin guide on page 2129
- Plan your Password Reset processes on page 2136
- Configure your Password Reset process on page 2136
- Password Reset and Password Change reports and logs on page 2212

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Use
• Service desk: Reset a password or unlock a user account on page 2208
• Unblock a Password Reset user on page 2210
• Users: Reset your password on Windows systems on page 2221

Develop
• Developer training
• Developer documentation

Integrate
• Integrate Password Reset with a CMS integration on page 2211

Troubleshoot and get help
• Ask or answer questions in the Change Management community
• Search the HI Knowledge Base for known error articles
• Contact ServiceNow Support

Password Reset setup guide

A simple version of the Password Reset application is active by default. You can install a plugin to extend functionality.

Requirements

Role required: admin

Note: The Password Reset application is not available during upgrade.

Active and available plugins

• A simple version of the Password Reset application is active by default and includes example verifications. The base system enables connections only to the Local ServiceNow Instance credential store type. For details, see Credential stores for Password Reset on page 2145.
• To enable connections to Active Directory (AD) and Remote (SOAP) ServiceNow Instance credential store types, you must activate the Password Reset - Orchestration Add-on plugin. The plugin also activates the Password Reset Windows Application (com.glideapp.password_reset_desktop). No other components are installed. Orchestration is available as a separate subscription. See Activate the Password Reset - Orchestration Add-on plugin on page 2112.

Next steps

Plan and configure the Password Reset processes for your organization. See the Password Reset admin guide on page 2129.
Activate the Password Reset - Orchestration Add-on plugin

The Password Reset - Orchestration Add-on plugin activates the Password Reset Windows Application (com.glideapp.password_reset_desktop) and enables connections to the Active Directory (AD) and 'Remote (SOAP) ServiceNow instance' credential store types. No other components are installed.

To purchase a subscription, contact your ServiceNow account manager. The account manager can arrange to have the plugin activated on your organization's production and sub-production instances, generally within a few days.

If you do not have an account manager, decide to delay activation after purchase, or want to evaluate the product on a sub-production instance without charge, follow these steps.

Role required: none

1. In the Hi Service Portal, click Service Requests Activate Plugin.
2. Fill out the form.

<table>
<thead>
<tr>
<th>Target Instance</th>
<th>Instance on which to activate the plugin.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plugin Name</td>
<td>Name of the plugin to activate.</td>
</tr>
<tr>
<td>Specify the date and time you would like this plugin to be enabled</td>
<td>Date and time must be at least 2 business days from the current time.</td>
</tr>
<tr>
<td>Reason/Comments</td>
<td>Provide any information that would be helpful for the ServiceNow personnel activating the plugin. For example, if you need the plugin activated at a specific time instead of during one of the default activation windows.</td>
</tr>
</tbody>
</table>

3. Click Submit.

Installed with Password Reset

Tables, roles, business rules, scripts, and workflows are installed with the Password Reset application.

Password Reset tables

<table>
<thead>
<tr>
<th>Table name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Password Reset Active Answer</td>
<td>Security questions and associated answers, in an encrypted state, that users selected while going through the enrollment process.</td>
</tr>
<tr>
<td>Table name</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Password Reset Active Question</td>
<td>Security questions that users selected while going through the enrollment process.</td>
</tr>
<tr>
<td>[pwd_active_question]</td>
<td></td>
</tr>
<tr>
<td>Password Reset Activity Log</td>
<td>All Password Reset requests.</td>
</tr>
<tr>
<td>[pwd_reset_activity]</td>
<td></td>
</tr>
<tr>
<td>Password Reset Activity Monitor</td>
<td>Password Reset lockout activity.</td>
</tr>
<tr>
<td>[pwd_activity_monitor]</td>
<td></td>
</tr>
<tr>
<td>Password Reset Credential Store</td>
<td>Password Reset credential stores that are available.</td>
</tr>
<tr>
<td>[pwd_cred_store]</td>
<td></td>
</tr>
<tr>
<td>Password Reset Credential Store Parameters</td>
<td>User-created credential store parameters.</td>
</tr>
<tr>
<td>[pwd_cred_store_param]</td>
<td></td>
</tr>
<tr>
<td>Password Reset Credential Store Types</td>
<td>Password Reset credential store types that are available.</td>
</tr>
<tr>
<td>[pwd_cred_store_type]</td>
<td></td>
</tr>
<tr>
<td>Password Reset Desktop Access Control</td>
<td>Password Reset Windows Application access control.</td>
</tr>
<tr>
<td>[pwd_access_control]</td>
<td></td>
</tr>
<tr>
<td>Password Reset Desktop Access Log</td>
<td>Password Reset Windows Application access logs.</td>
</tr>
<tr>
<td>[pwd_access_log]</td>
<td></td>
</tr>
<tr>
<td>Password Reset Device Enrollment Code</td>
<td>Device enrollment codes that were sent to users during SMS code enrollment.</td>
</tr>
<tr>
<td>[pwd_dvc_enrollment_code]</td>
<td></td>
</tr>
<tr>
<td>Password Reset Devices</td>
<td>User SMS devices that are in a state of verified.</td>
</tr>
<tr>
<td>[pwd_device]</td>
<td></td>
</tr>
<tr>
<td>Password Reset Email Verification Code</td>
<td>Verification codes that were sent to users via email for password reset or email address enrollment.</td>
</tr>
<tr>
<td>[pwd_email_code]</td>
<td></td>
</tr>
<tr>
<td>Password Reset Enrollment for Verification</td>
<td>Information about user enrollment by verification.</td>
</tr>
<tr>
<td>[pwd_enrollment]</td>
<td></td>
</tr>
<tr>
<td>Password Reset Enrollment Snapshot</td>
<td>Snapshot of user enrollment by verification. This table is regenerated daily by a scheduled job named Password Reset Enrollment Snapshot.</td>
</tr>
<tr>
<td>[pwd_enrollment_snapshot]</td>
<td></td>
</tr>
<tr>
<td>Password Reset Extension Type</td>
<td>Extension types that are available.</td>
</tr>
<tr>
<td>[pwd_extension_type]</td>
<td></td>
</tr>
<tr>
<td>Password Reset History</td>
<td>History of passwords that users reset.</td>
</tr>
<tr>
<td>[pwd_history]</td>
<td></td>
</tr>
<tr>
<td>Password Reset Identification Type</td>
<td>Password Reset identification types that are available.</td>
</tr>
<tr>
<td>[pwd_identification_type]</td>
<td></td>
</tr>
<tr>
<td>Table name</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Password Reset Process</td>
<td>Password Reset processes that are available.</td>
</tr>
<tr>
<td>[pwd_process]</td>
<td></td>
</tr>
<tr>
<td>Password Reset Process Credential Store</td>
<td>Credential stores and the associated Password Reset processes that the application is using.</td>
</tr>
<tr>
<td>[pwd_map_proc_to_cred_store]</td>
<td></td>
</tr>
<tr>
<td>Password Reset Process User Group</td>
<td>Groups and the associated Password Reset processes that the application is using.</td>
</tr>
<tr>
<td>[pwd_map_proc_to_group]</td>
<td></td>
</tr>
<tr>
<td>Password Reset Process Verification</td>
<td>Verifications and the associated Password Reset processes that the application is using.</td>
</tr>
<tr>
<td>[pwd_map_proc_to_verification]</td>
<td></td>
</tr>
<tr>
<td>Password Reset Question</td>
<td>Questions that the application uses for security question verifications.</td>
</tr>
<tr>
<td>[pwd_question]</td>
<td></td>
</tr>
<tr>
<td>Password Reset Request</td>
<td>Information about Password Reset requests.</td>
</tr>
<tr>
<td>[pwd_reset_request]</td>
<td></td>
</tr>
<tr>
<td>Password Reset Request Verification</td>
<td>Password reset requests and the associated verification that the application is using.</td>
</tr>
<tr>
<td>[pwd_map_request_to_verification]</td>
<td></td>
</tr>
<tr>
<td>Password Reset SMS Verification Code</td>
<td>SMS verification codes that were sent to users for a password reset.</td>
</tr>
<tr>
<td>[pwd_sms_code]</td>
<td></td>
</tr>
<tr>
<td>Password Reset User Lockout</td>
<td>Users that are locked out of Password Reset.</td>
</tr>
<tr>
<td>[pwd_user_lockout]</td>
<td></td>
</tr>
<tr>
<td>Password Reset Verification</td>
<td>Verifications that are available.</td>
</tr>
<tr>
<td>[pwd_verification]</td>
<td></td>
</tr>
<tr>
<td>Password Reset Verification Param</td>
<td>User-created verification parameters.</td>
</tr>
<tr>
<td>[pwd_verification_param]</td>
<td></td>
</tr>
<tr>
<td>Password Reset Verification Type</td>
<td>Password Reset verification types that are available.</td>
</tr>
<tr>
<td>[pwd_verification_type]</td>
<td></td>
</tr>
</tbody>
</table>

**Password Reset roles**

<table>
<thead>
<tr>
<th>Role</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>password reset administrator</td>
<td>Configures and maintains Password Reset and Password Change.</td>
</tr>
<tr>
<td>[password_reset_admin]</td>
<td></td>
</tr>
<tr>
<td>service desk agent</td>
<td>Resets passwords on behalf of users, tracks password reset requests, and views logs.</td>
</tr>
<tr>
<td>[password_reset_service_desk]</td>
<td></td>
</tr>
<tr>
<td>Role</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>credentials manager</td>
<td>Determines which credential stores are valid for use with Password Reset.</td>
</tr>
<tr>
<td>[password_reset Credential manager]</td>
<td></td>
</tr>
</tbody>
</table>

**Password Reset business rules**

<table>
<thead>
<tr>
<th>Business rule</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abort if password history limit exceeds</td>
<td>Password Reset Credential Store Parameters [pwd_cred_store_param]</td>
<td>Prevents setting password history limit that exceeds the value of the password_reset.history.limit property.</td>
</tr>
<tr>
<td>Add default parameters QA verification</td>
<td>Password Reset Verification [pwd_verification]</td>
<td>If no parameters for Security Question verifications are specified, generates parameters.</td>
</tr>
<tr>
<td>Add default parameters SMS verification</td>
<td>Password Reset Verification [pwd_verification]</td>
<td>If there are no parameters specified, generates SMS code verifications parameters.</td>
</tr>
<tr>
<td>Add params personal confirm verification</td>
<td>Password Reset Verification [pwd_verification]</td>
<td>If there are no parameters specified, generates personal data confirmation verifications parameters.</td>
</tr>
<tr>
<td>Add params personal verification</td>
<td>Password Reset Verification [pwd_verification]</td>
<td>If there are no parameters specified, generates parameters for personal data verification.</td>
</tr>
<tr>
<td>Check unique verifications</td>
<td>Password Reset Process Verification [pwd_map_proc_to_verification]</td>
<td>Prevents a verification from being assigned multiple times to a specific Password Reset process.</td>
</tr>
<tr>
<td>Clear parameters for Mock verification</td>
<td>Password Reset Verification [pwd_verification]</td>
<td>Clears parameters for the Mock verification.</td>
</tr>
<tr>
<td>Deactivate process with no group</td>
<td>Password Reset Process User Group [pwd_map_proc_to_group]</td>
<td>Deactivates the process if it does not apply to all users or if the groups associated with it are removed.</td>
</tr>
<tr>
<td>Deactivate process with no verification</td>
<td>Password Reset Process Verification [pwd_map_proc_to_verification]</td>
<td>Deactivates the process if the verifications associated with the process are less than the minimum value for the process.</td>
</tr>
<tr>
<td>Deactivate process with no verification</td>
<td>Password Reset Process Verification [pwd_map_proc_to_verification]</td>
<td>Deactivates the process if the verifications associated with it are removed.</td>
</tr>
<tr>
<td>Business rule</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>--------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Delete history passwords if needed</td>
<td>Password Reset Credential Store [pwd_cred_store]</td>
<td>Deletes history passwords if needed.</td>
</tr>
<tr>
<td>Enforce password history message</td>
<td>Password Reset Credential Store [pwd_cred_store]</td>
<td>Passes enforce password history related messages to the client side.</td>
</tr>
<tr>
<td>Google Auth Enabled Check</td>
<td>Password Reset Process [pwd_process]</td>
<td>Deactivates the process with Google Authenticator verification if the Google authenticator is disabled.</td>
</tr>
<tr>
<td>GoogleAuthSysPropertyCheck</td>
<td>Password Reset Process Verification [pwd_map_proc_to_verification]</td>
<td>Deactivates the process with the Google Authenticator verification if the Google authenticator is disabled.</td>
</tr>
<tr>
<td>Handle req_enroll validation/ default val</td>
<td>Password Reset Process Verification [pwd_map_proc_to_verification]</td>
<td>Handles requires_enrollment and auto_enroll values for the process.</td>
</tr>
<tr>
<td>Insert/update scheduled job for reminder</td>
<td>Password Reset Process [pwd_process]</td>
<td>Inserts/updates the scheduled job for enrollment reminder.</td>
</tr>
<tr>
<td>Order must be unique</td>
<td>Password Reset Desktop Access Control [pwd_access_control]</td>
<td>Enforces order to be unique.</td>
</tr>
<tr>
<td>Parameter Names Cannot Be Updated</td>
<td>Password Reset Verification Param [pwd_verification_param]</td>
<td>Prevents parameter name changes.</td>
</tr>
<tr>
<td>Password Reset Activity Monitor</td>
<td>Password Reset User Lockout [pwd_user_lockout]</td>
<td>Creates an event when the number of users locked out of Password Reset during a specific interval exceeds the threshold value.</td>
</tr>
<tr>
<td>Password Reset Validate Auto-generate</td>
<td>Password Reset Process [pwd_process]</td>
<td>Checks that either Email password or Display password is selected when the Auto-generate password check box is selected.</td>
</tr>
<tr>
<td>Personal Data Confirm Param Validation</td>
<td>Password Reset Verification Param [pwd_verification_param]</td>
<td>Checks that a column exists in the sys_user table for the parameter used in a personal data confirmation verification.</td>
</tr>
<tr>
<td>Personal Data Param Validation</td>
<td>Password Reset Verification Param [pwd_verification_param]</td>
<td>Checks that a column exists in the sys_user table for the parameter used in a personal data verification.</td>
</tr>
<tr>
<td>Business rule</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>--------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Prevent against deletion</td>
<td>Password Reset Credential Store [pwd_cred_store]</td>
<td>Checks whether the credential store is part of an active process before allowing deletion.</td>
</tr>
<tr>
<td>Prevent against deletion</td>
<td>Password Reset Identification Type [pwd_identification_type]</td>
<td>If an identification type is part of an active process, prevents the identification type from being deleted.</td>
</tr>
<tr>
<td>Prevent against deletion</td>
<td>Password Reset Verification [pwd_verification]</td>
<td>If the verification is part of an active process, prevents it from being deleted.</td>
</tr>
<tr>
<td>Prevent against deletion when in use</td>
<td>Password Reset Credential Store Types [pwd_cred_store_type]</td>
<td>Prevents deletion when the type is in use.</td>
</tr>
<tr>
<td>Prevent against deletion when in use</td>
<td>Password Reset Verification Type [pwd_verification_type]</td>
<td>Prevents deletion when the type is in use.</td>
</tr>
<tr>
<td>Queue event if history limit decreases</td>
<td>Password Reset Credential Store Parameters [pwd_cred_store_param]</td>
<td>Queues the pwd.credStore.history.limit.decrease event if history limit decreases.</td>
</tr>
<tr>
<td>Send SMS code</td>
<td>Password Reset Device Enrollment Code [pwd_dvc_enrollment_code]</td>
<td>Sends an enrollment code to a device.</td>
</tr>
<tr>
<td>Set new record flag</td>
<td>Password Reset Process [pwd_process]</td>
<td>Sets a new record flag for the client to take appropriate action.</td>
</tr>
<tr>
<td>Send SMS Verification Code Via Notify</td>
<td>Password Reset SMS Verification Code [pwd_sms_code]</td>
<td>Sends out SMS authentication code via Notify if the Notify plugin is active.</td>
</tr>
<tr>
<td>Single credential store per process</td>
<td>Password Reset Process Credential Store [pwd_map_proc_to_cred_store]</td>
<td>Prevents having more than one credential store per process.</td>
</tr>
<tr>
<td>SMS Code Param Validation</td>
<td>Password Reset Verification Param [pwd_verification_param]</td>
<td>Checks for valid parameters in SMS code verifications.</td>
</tr>
<tr>
<td>Business rule</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>--------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Update action based on access conditions</td>
<td>Password Reset Desktop Access Log [pwd_access_log]</td>
<td>Updates the “action” field of this log record based on the access control conditions.</td>
</tr>
<tr>
<td>Update proc_to_credential_store</td>
<td>Password Reset Process [pwd_process]</td>
<td>Enforces a one-to-one relation between a Password Reset process and a credential store.</td>
</tr>
<tr>
<td>Validate Process</td>
<td>Password Reset Process [pwd_process]</td>
<td>Verifies that a Password Reset process is configured correctly.</td>
</tr>
<tr>
<td>Validate Pwd Cred Store Name</td>
<td>Password Reset Credential Store [pwd_cred_store]</td>
<td>Enforces the name to be unique.</td>
</tr>
<tr>
<td>Validate Pwd Cred Store Type Name</td>
<td>Password Reset Credential Store Types [pwd_cred_store_type]</td>
<td>Enforces the name to be unique.</td>
</tr>
<tr>
<td>Validate Pwd Extension Type Name</td>
<td>Password Reset Extension Type [pwd_extension_type]</td>
<td>Enforces the name to be unique.</td>
</tr>
<tr>
<td>Validate Pwd Identification Type Name</td>
<td>Password Reset Identification Type [pwd_identification_type]</td>
<td>Enforces the name to be unique and not empty.</td>
</tr>
<tr>
<td>Validate Pwd Process Name</td>
<td>Password Reset Process [pwd_process]</td>
<td>Enforces the name to be unique.</td>
</tr>
<tr>
<td>Validate Pwd Verification Name</td>
<td>Password Reset Verification [pwd_verification]</td>
<td>Enforces the name to be unique.</td>
</tr>
<tr>
<td>Validate Pwd Verification Type Name</td>
<td>Password Reset Verification Type [pwd_verification_type]</td>
<td>Enforces the name to be unique.</td>
</tr>
<tr>
<td>Validate Security Question</td>
<td>Password Reset Question [pwd_question]</td>
<td>Validates rules for security questions such as no duplicates or empty questions.</td>
</tr>
<tr>
<td>Verify Account Lookup Script</td>
<td>Password Reset Credential Store [pwd_cred_store]</td>
<td>Checks whether the account lookup script has the correctly named function.</td>
</tr>
<tr>
<td>Verify AutoEnroll</td>
<td>Password Reset Verification Type [pwd_verification_type]</td>
<td>Checks whether auto-enroll is selected and ensures that an enrollment check script is provided.</td>
</tr>
</tbody>
</table>
## Password Reset UI pages

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$pwd_reset</td>
<td>First page of self-service reset process (asks for user ID).</td>
</tr>
<tr>
<td>$pwd_reset_serviceDesk</td>
<td>First page of service desk assisted reset process (asks for user ID).</td>
</tr>
<tr>
<td>$pwd_verify</td>
<td>Second page of reset process (asks user to verify identity).</td>
</tr>
<tr>
<td>$pwd_new</td>
<td>Last page of password change process (asks for new password).</td>
</tr>
<tr>
<td>$pwd_success</td>
<td>Page that appears when password is reset successfully.</td>
</tr>
<tr>
<td>$pwd_error</td>
<td>Page that appears on error during reset process.</td>
</tr>
<tr>
<td>$pwd_confirm</td>
<td>For processes configured to email password reset URL: After successful verification, this page displays message about sending link to user.</td>
</tr>
<tr>
<td>$pwd_change</td>
<td>Page for changing password.</td>
</tr>
<tr>
<td>$pwd_change_success</td>
<td>Page that appears when password is changed successfully.</td>
</tr>
<tr>
<td>$pwd_change_error</td>
<td>Page that appears on error during password change process.</td>
</tr>
<tr>
<td>$pwd_enrollment_form_container</td>
<td>Enrollment page for all verifications.</td>
</tr>
<tr>
<td>$pwd_enrollment_success</td>
<td>Page that appears when enrollment is successful.</td>
</tr>
<tr>
<td>$pwd_enroll_error</td>
<td>Page that appears when any error happens during enrollment.</td>
</tr>
<tr>
<td>$pwd_unlock_success</td>
<td>Page that appears when locked user is successfully unlocked.</td>
</tr>
<tr>
<td>$pwd_reset_downloads_ui</td>
<td>Page for downloading Password Reset Windows Application.</td>
</tr>
</tbody>
</table>

## Password Reset UI macros

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$pwd_csrf_validation</td>
<td>CSRF validation for Password Reset Application. If violation is detected, the page will be redirected to the error page.</td>
</tr>
<tr>
<td>$pwd_display_password</td>
<td>Displays a temporary password on the success page if the process is configured to auto-generate.</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>$pwd_enroll_email_ui and $pwd_verify_email_ui</td>
<td>UI for email enrollment and verification.</td>
</tr>
<tr>
<td>$pwd_enroll_google_auth_ui and $pwd_verify_google_auth_ui</td>
<td>UI for Google Authentication enrollment and verification.</td>
</tr>
<tr>
<td>$pwd_enroll_questions_ui</td>
<td>UI for question and answer security validation enrollment.</td>
</tr>
<tr>
<td>$pwd_enroll_questions_ui.js</td>
<td>JavaScript code that requires server-side data for security question and answer enrollment.</td>
</tr>
<tr>
<td>$pwd_enroll_sample_ui</td>
<td>Sample UI macro for enrollment for Mock Verification Type.</td>
</tr>
<tr>
<td>$pwd_enroll_sms_ui and $pwd_verify_sms_ui</td>
<td>UI for SMS enrollment and verification.</td>
</tr>
<tr>
<td>$pwd_enrollment_form_title</td>
<td>Jelly macro function that prints the title for the enrollment form. A verification ID is mandatory.</td>
</tr>
<tr>
<td>$pwd_error_message</td>
<td>UI for displaying error messages.</td>
</tr>
<tr>
<td>$pwd_process_flow</td>
<td>UI for indicating current stage.</td>
</tr>
<tr>
<td>$pwd_process_footer</td>
<td>JavaScript code to get the footer macro name.</td>
</tr>
<tr>
<td>$pwd_reset_stylesheet</td>
<td>JavaScript code to get the default CSS file ID.</td>
</tr>
<tr>
<td>$pwd_verify_personal_data_ui and $pwd_verify_personal_data_confirmation_ui</td>
<td>UI for verifying personal data and for confirming personal data.</td>
</tr>
<tr>
<td>$pwd_verify_questions_ui</td>
<td>UI for verifying questions.</td>
</tr>
<tr>
<td>$pwd_verify_simple_ui</td>
<td>Input section for a simple verification method. This field is a single input field.</td>
</tr>
</tbody>
</table>

**UI scripts installed with Password Reset**

You can create a UI script and reference the script from a UI macro or UI page by using a `<g:include_script>` Jelly tag. The following example shows how the $pwd_enroll_questions_ui UI macro can reference the $pwd_enroll_questions_ui script. In the example, [UI Script Name]+".jsdbx" is the name of the script:

```
<g:include_script src="$pwd_enroll_questions_ui.jsdbx" />  
```

By referencing an external script, you can maintain separation between client JavaScript code and Jelly code, which simplifies maintenance. You can use the following installed scripts with Password Reset UI macros:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$pwd_csrf_common_ui_script</td>
<td>Common UI script for handling a Cross-site Request Forgery (CSRF).</td>
</tr>
<tr>
<td>$pwd_enroll_email_ui</td>
<td>JavaScript code for the $pwd_enroll_questions_ui UI macro.</td>
</tr>
<tr>
<td>$pwd_enroll_google_auth_ui</td>
<td>JavaScript code for the $pwd_enroll_google_auth_ui UI macro.</td>
</tr>
<tr>
<td>$pwd_enroll_questions_ui</td>
<td>JavaScript code for the $pwd_enroll_questions_ui UI macro.</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>$pwd_enroll_sample_ui</td>
<td>Included sample client JavaScript for the $pwd_enroll_sample_ui UI macro.</td>
</tr>
<tr>
<td>$pwd_enroll_sms_ui</td>
<td>SMS enrollment UI script.</td>
</tr>
<tr>
<td>$pwd_enrollment_submit_event</td>
<td>UI script for an enrollment submission event.</td>
</tr>
<tr>
<td>$pwd_util</td>
<td>Utilities for password reset UI pages and UI macros.</td>
</tr>
<tr>
<td>$pwdWfManager</td>
<td>Helper class to handle workflow activities and post-processing.</td>
</tr>
</tbody>
</table>

**Password Reset workflows**

The Password Reset plugin adds workflows that you can use as examples to create custom workflows for Password Reset processes.

**Table 992: Workflows that connect to a credential stores**

<table>
<thead>
<tr>
<th>Workflow</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pwd Reset - AD</td>
<td>Connects to an AD server.</td>
</tr>
<tr>
<td>Pwd Reset - Local ServiceNow</td>
<td>Current (local) instance.</td>
</tr>
<tr>
<td>Pwd Reset - Master</td>
<td>Password Reset master workflow.</td>
</tr>
<tr>
<td>Pwd Reset - Mock Fatal</td>
<td>Example workflow to use in Password Reset testing to simulate a fatal error. No retries.</td>
</tr>
<tr>
<td>Pwd Reset - Mock Non Fatal</td>
<td>Example workflow to use in Password Reset testing to simulate a non-fatal error.</td>
</tr>
<tr>
<td>Pwd Reset - Mock Success</td>
<td>Example workflow to use in Password Reset testing to simulate a successful completion.</td>
</tr>
<tr>
<td>Pwd Reset - Remote ServiceNow</td>
<td>Connects to a remote(SOAP) ServiceNow instance.</td>
</tr>
</tbody>
</table>

**Table 993: Workflows that test the connection to a credential store**

<table>
<thead>
<tr>
<th>Workflow</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pwd Connection Test - AD</td>
<td>Tests connection to an AD server.</td>
</tr>
<tr>
<td>Pwd Connection Test - Local SN</td>
<td>Tests connection to local instance.</td>
</tr>
<tr>
<td>Pwd Connection Test - Master</td>
<td>Master workflow to test credential store connectivity.</td>
</tr>
<tr>
<td>Pwd Connection Test - Mock Failure</td>
<td>Example credential store connection test that simulates a failed connection.</td>
</tr>
<tr>
<td>Pwd Connection Test - Mock Success</td>
<td>Example credential store connection test that simulates a successful connection.</td>
</tr>
<tr>
<td>Workflow</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Pwd Connection Test - Remote SN</td>
<td>Tests connection to a remote(SOAP) ServiceNow instance.</td>
</tr>
</tbody>
</table>

**Table 994: Workflows that determine the lock state of a user account**

<table>
<thead>
<tr>
<th>Workflow</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pwd Get Lock State - AD</td>
<td>Gets a user account lock state for the AD server.</td>
</tr>
<tr>
<td>Pwd Get Lock State - Local SN</td>
<td>Workflow to get a user account lock state for the local instance.</td>
</tr>
<tr>
<td>Pwd Get Lock State - Master</td>
<td>Master workflow to get a user account lock state.</td>
</tr>
<tr>
<td>Pwd Get Lock State - Remote SN</td>
<td>Gets a user account lock state for the remote(SOAP) ServiceNow instance.</td>
</tr>
</tbody>
</table>

**Table 995: Workflows that unlock a user account**

<table>
<thead>
<tr>
<th>Workflow</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pwd Unlock Account – AD</td>
<td>Unlocks a user account for a local instance.</td>
</tr>
<tr>
<td>Pwd Unlock Account - Local SN</td>
<td>Workflow to unlock a user account for a local instance.</td>
</tr>
<tr>
<td>Pwd Unlock Account - Master</td>
<td>Master workflow to unlock a user account.</td>
</tr>
<tr>
<td>Pwd Unlock Account – Remote SN</td>
<td>Unlocks a user account for a remote(SOAP) ServiceNow instance.</td>
</tr>
</tbody>
</table>

**Table 996: Workflows that change a password**

<table>
<thead>
<tr>
<th>Workflow</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pwd Change - Master</td>
<td>Password change master workflow.</td>
</tr>
<tr>
<td>Pwd Change – Local ServiceNow</td>
<td>Connects to a local instance to change a password.</td>
</tr>
<tr>
<td>Pwd Change – AD</td>
<td>Connects to an AD server to change a password.</td>
</tr>
<tr>
<td>Pwd Change – Remote ServiceNow</td>
<td>Connects to a remote(SOAP) ServiceNow instance to change a password.</td>
</tr>
</tbody>
</table>

**Password Reset notifications**

<table>
<thead>
<tr>
<th>Name</th>
<th>Fired by event name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Password Reset – Send SMS Code</td>
<td>pwd.send_sms_code.trigger</td>
<td>Sends out SMS authentication code for verification.</td>
</tr>
<tr>
<td>Name</td>
<td>Fired by event name</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>--------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>[K] Password Reset – Send Email Code</td>
<td>pwd.send_email_code.trigger</td>
<td>Sends out authentication code via Email for verification.</td>
</tr>
<tr>
<td>Password Reset - Enrollment Reminder</td>
<td>pwd.enrollment_reminder.trigger</td>
<td>Sends emails to remind users to enroll in the required verifications.</td>
</tr>
<tr>
<td>Password Reset - New Password Confirmation</td>
<td>pwd.email.trigger</td>
<td>For the Email Password process, sends an email that includes the new password.</td>
</tr>
<tr>
<td>Password Reset - Send Verify Code</td>
<td>pwd.send_verify_code.trigger</td>
<td>Sends authentication code to users using email or SMS for password reset or enrollment.</td>
</tr>
<tr>
<td>Note: If the Notify plugin is active, SMS code is sent via Twilio instead of ServiceNow Notification.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Password Reset URL</td>
<td>password.reset.url</td>
<td>For the Email Password Reset URL process: Sends email that includes a link to the password reset URL.</td>
</tr>
<tr>
<td>Note: Check the following items if the instance does not send the email notification to the user:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Check the System Event [sys_event] table to see if the email was sent.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Verify that the user is subscribed to the notification.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Verify that the Default Self Service password reset process and password reset properties are configured correctly.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SOAP messages for Password Reset

<table>
<thead>
<tr>
<th>SOAP Message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change Password</td>
<td>When the Orchestration Add-on plugin is active, the system can use the SOAP protocol to change passwords on remote credential stores such as a remote ServiceNow instance.</td>
</tr>
<tr>
<td>Password Reset Request</td>
<td>When the Orchestration Add-on plugin is active, the system can use the SOAP protocol to reset passwords on remote credential stores such as a remote ServiceNow instance.</td>
</tr>
</tbody>
</table>

REST API

Name: Pwd Reset
API ID: pwd_reset
Base API path: /api/now/pwd_reset

Table 997: Resources (Version v1)

<table>
<thead>
<tr>
<th>Name</th>
<th>Resource path</th>
<th>API Version</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>pwd_init</td>
<td>/api/now/v1/pwd_reset/</td>
<td>v1</td>
<td>Initial request to establish session, write logs, and fetch UI messages.</td>
</tr>
<tr>
<td></td>
<td>init</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pwd_identify</td>
<td>/api/now/v1/pwd_reset/</td>
<td>v1</td>
<td>Get identification page components.</td>
</tr>
<tr>
<td></td>
<td>identify</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pwd_verify</td>
<td>/api/now/v1/pwd_reset/</td>
<td>v1</td>
<td>Get verification page components.</td>
</tr>
<tr>
<td></td>
<td>verify</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pwd_new</td>
<td>/api/now/v1/pwd_reset/</td>
<td>v1</td>
<td>Get resetting password page components.</td>
</tr>
<tr>
<td></td>
<td>reset</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pwd_success</td>
<td>/api/now/v1/pwd_reset/</td>
<td>v1</td>
<td>Get success page components.</td>
</tr>
<tr>
<td></td>
<td>success</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pwd_failure</td>
<td>/api/now/v1/pwd_reset/</td>
<td>v1</td>
<td>Get failure page components.</td>
</tr>
<tr>
<td></td>
<td>failure</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 998: Resources (Version v2)

<table>
<thead>
<tr>
<th>Name</th>
<th>Resource path</th>
<th>API Version</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>pwd_init</td>
<td>/api/now/v2/pwd_reset/</td>
<td>v2</td>
<td>Initial request to establish session, write logs, and fetch UI messages.</td>
</tr>
<tr>
<td></td>
<td>init</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Resource path</td>
<td>API Version</td>
<td>Description</td>
</tr>
<tr>
<td>----------------</td>
<td>------------------------</td>
<td>-------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>pwd_identify</td>
<td>/api/now/v2/pwd_reset/ identify</td>
<td>v2</td>
<td>Get identification page components.</td>
</tr>
<tr>
<td>pwd_verify</td>
<td>/api/now/v2/pwd_reset/ verify</td>
<td>v2</td>
<td>Get verification page components.</td>
</tr>
<tr>
<td>pwd_new</td>
<td>/api/now/v2/pwd_reset/ reset</td>
<td>v2</td>
<td>Get reset password page components.</td>
</tr>
<tr>
<td>pwd_success</td>
<td>/api/now/v2/pwd_reset/ success</td>
<td>v2</td>
<td>Get success page components.</td>
</tr>
<tr>
<td>pwd_failure</td>
<td>/api/now/v2/pwd_reset/ failure</td>
<td>v2</td>
<td>Get failure page components.</td>
</tr>
</tbody>
</table>

Domain separation in the Password Reset application

A password reset process that you define in any domain is isolated from a process that you create in any other domain. Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.

Overview

Support: Level 2

Domain separation is supported in this application. Not all ServiceNow applications support domain separation; some include limitations on the data and administrative settings that can be domain separated. To learn more, see Application support for domain separation.

Each password reset process follows these steps:

1. The end user asks to reset the password.
2. The user provides identifying information (typically username or email address).
3. The user verifies the identity — proves that they are who they say they are (typically by answering questions or submitting a code number that was delivered securely).
4. The instance connects to the credential store to confirm the user credentials.
5. The instance generates the new password and displays it to the user.

How domain separation works in Password Reset

Domain separation for Password Reset is applied at the process level. The admin configures the following elements to define a password reset process: A connection to a credential store, user groups that can use the process, method of identification, and verifications to use during the process.

- A connection to the credential store where user credentials (like username/password) are securely stored. Each connection inherits the domain setting from a template called a connection type. Each connection type is tied to a domain (the connection type record has a domain field). There are uniqueness constraints on connection names within a domain.
- One or more user groups on the ServiceNow instance that can use the password reset process. User accounts are members of one or more domains — they use the standard ServiceNow domain
separation. When a user enrolls to use one of the password reset processes that is configured for the organization, the user is allowed to choose only from the processes in the user’s domain.

- The identification — the method that the end user employs to claim identity for the public password reset or password change process. Each identification inherits the domain setting from a template called an identification type. Each identification type is tied to a domain (the identification type record has a domain field). There are uniqueness constraints on identification names within a domain.
- One or more verifications — methods to verify the identity of the person who is attempting to reset the password. Each verification inherits the domain setting from a template called a verification type. Each verification type is tied to a domain (the verification type record has a domain field). There are uniqueness constraints on verification names within a domain.
- All Password Reset tables have a domain column.
- Password Reset process tables include a sys-overrides column on business rules, UI actions, and so on.
- The Password Reset application is built using Orchestration. Orchestration supports "Data only" domain separation — the data security model of separating visibility of data from one domain to another.

Self-service and Service desk-assisted processes

In addition to configuring the connections, user groups, identifications, and verifications that are used in each process, the admin specifies one of the following operational methods for the organization:

- Self-service process: End users reset passwords over the Internet using a browser on any supported interface, including mobile devices. The end user can select from any configured process in the end user’s domain (or child domain of an end user’s domain).
- Service desk-assisted process: End users do not reset passwords. An end user requests the assistance of a service desk agent, over the phone or in person. The agent processes the request. Each service desk agent has the Password Reset Admin service desk role. The "reset request" form that the agent works in presents a User field and a Process field. On the form, the agent can view all processes in the end user's domain, even if the agent is not a member of one or more of the domains.

Password Change process

The Password Change application extends the Password Reset application by letting admins define how users change their passwords. A service desk-assisted process is not supported. An admin must publish the URL for the self-service password change form.

The Password Change application enables an end user to change a password over the Internet using a browser on any supported interface, including mobile devices. The end user can select from any configured process in the end user's domain (or child domain of an end user's domain).

A password change process uses the same elements as a password reset process (connections, user groups, identifications, and verifications), with the same domain-separation features.

Password Reset Windows Application

The Password Reset Windows Application enables a user who forgets the password or is locked out of a Windows computer to reset the password directly from the Windows login screen.

Installer and documentation

Download the installer and installation instructions from KB0542328 in the ServiceNow Knowledge Base. The installer uninstalls any earlier version of the Password Reset Windows Application.
How the Password Reset Windows Application works

Administrators download and run an EXE or MSI file to install or distribute the application to user computers. The application installs a link on the Windows login screen. The user clicks the link (Forgot Password? in the examples on various Windows versions) and is then guided through the process of resetting the password.
By default, when a user requests a reset, the instance sends the user a URL with a user-specific token. After the user opens the URL, the instance prompts the user to enter and confirm the new password. The instance does not send a temporary password.

**Restrictions on the Password Reset Windows Application**

- The Password Reset Windows Application does not support custom verifications.
- The Password Reset Windows Application uses the base-system CAPTCHA service even if the Password Reset application is configured to use Google reCAPTCHA with the web interface. See the section titled "Settings on the Details tab" in *Configure your Password Reset process* on page 2136.
- The Password strength indicator is not supported. See *Configure the connection to a credential store for the Password Reset processes* on page 2148.
- For some verification types, you can use only one verification. Custom verifications are not supported. See *Password Reset verifications* on page 2155 for details.
- Custom UI macros configured on the Process Advanced page are not supported (for example, entry, success, or failure macros). The system displays only the default success and failure messages.
- The Password Reset Windows Application supports newline characters in the Password rule hint text. Other formatting is not supported (bold, underline, hyperlink, and so on). See *Configure the connection to a credential store for the Password Reset processes* on page 2148.

**Password Reset Windows Application installation requirements**

You must activate the Password Reset Orchestration Add-on plugin to use the Password Reset Windows Application.

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Description</th>
</tr>
</thead>
</table>
| Required ServiceNow release  | • Password Reset Windows Application version 2.X is supported on Helsinki and newer releases.  
                               | • Password Reset Windows Application version 3.X is supported on Kingston and newer releases. |
### Requirement Description

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Required hardware**        | • 1 GHz or faster processor  
• 512 MB of RAM  
• 10 MB of available hard disk space (x86)  
• 10 MB of available hard disk space (x64) |

<table>
<thead>
<tr>
<th><strong>Required software</strong></th>
<th><strong>Version of Password Reset Windows Application</strong></th>
<th><strong>Microsoft .NET Framework</strong></th>
<th><strong>Microsoft Visual C++ Redistributable Package</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.9, 3.2 and earlier</td>
<td>4.5.2 and newer</td>
<td>2013</td>
</tr>
<tr>
<td></td>
<td>2.10, 3.3</td>
<td>4.7.1 and newer</td>
<td>2013</td>
</tr>
</tbody>
</table>

| **Supported operating systems** | • Windows 7  
• Windows 8.1  
• Windows 10 Enterprise  
• Windows 10 Pro |
| **Supported processor architecture** | • X86  
• X64 |
| **Supported network architecture** | • Password Reset Windows Application clients must have direct access to both the Internet and the ServiceNow instance where the Password Reset Windows Application is configured  
• To reset an AD password, the client must be on the corporate network. |

---

### Password Reset admin guide

The Password Reset application enables an end user to reset or change a password using a self-service process. Alternatively, your organization can implement a process that requires a service desk agent to reset passwords for end users.

Watch the video: *Introducing Password Reset (Video)*

### Password Reset processes

Users with the password_reset_admin role configure how the process of resetting a password works for an end user.

- **Self-service process:** Users reset passwords over the Internet using a browser on any supported interface, including mobile devices.
- **Service desk-assisted process:** A user requests the assistance of a service desk agent, over the phone or in person. Users do not reset passwords.
End-user experience of the self-service process

The following example is typical:

1. On the login page, the user clicks the Forgot Password? link to start the process.

2. The Identify page opens and the user enters their identifying information (typically username or email address). The example includes the default Google reCAPTCHA security feature:
3. On the Verify page, the user verifies their identity by providing information that proves that they are who they say they are. You, the admin, configure the method of verification and you can require multiple verifications. In the example, the admin has configured the Security Question verification. The user must answer a question to prove identity. (Earlier, the user selected the question and provided a secure private answer while enrolling for the password reset process.) Other possible verifications require the user to enter a code number that was sent to a mobile device by SMS text, through the Google Authenticator app, or by email.

4. The system checks the credential store to verify identity and then displays the new password on the Reset page.
Elements of a password reset process

You configure the following elements of the process for your organization:

- A connection to the credential store for your organization where user credentials (like username/password) are securely stored.
- One or more user groups on the ServiceNow instance that can use the password reset process.
- The type of identification that users must enter to identify themselves (typically username or email address).
- One or more verifications — methods to verify the identity of the user. Examples:
  - Answer a question that only the user knows how to answer — the QA Verification (based on the Security Question verification type).
  - Enter a code number that was emailed to the user — the Email verification.
  - Enter a code number that was texted to a mobile device — the SMS verification.
• Enter a code number that appears on the Google Authenticator app on a mobile device — the Google Authenticator verification.

How you implement a password reset process

1. Plan your implementation: Ensure that all applicable organizational guidelines, security policies, and areas of the organization are considered.
2. Set up the elements of the password reset and password change processes according to the plan:
   • Connection to the credential store.
   • User groups that will use the password reset process.
   • Identification type to use.
   • Verifications to use.
3. In the service desk-assisted model, assign service desk agents to monitor and reset passwords as needed.
4. Monitor password reset activity to identify security threats and to ensure compliance with the password policy requirements of your organization.

Password Reset Windows Application

If a user forgets the password or gets locked out of a Windows computer, the user can reset the password directly from the Windows login screen. The user clicks the Forgot Password? link and is then guided through the process of resetting the password. To learn more, see Password Reset Windows Application on page 2126.

Password Change application

The Password Change application extends the Password Reset application by letting admins define how users change their passwords. Only a self-service process is supported and an admin must publish the URL to the password change form.

1. The user logs in to the instance and then selects the Change Password module or link from the user profile record. Password change is supported on mobile devices.
2. On the Change Password page, the user selects the credential store where the password resides.
3. The user enters the old password and then enters and confirms a new password.
4. Workflows validate the old password and then implement the new password.
5. The system notifies the user that the password was changed.

What to do next

Plan your Password Reset processes on page 2136

Example: The default self-service Password Reset process

The default self-service Password Reset process enables a user to reset the password without assistance from service desk agents.
The default self-service password reset flow

1. If a user does not remember the password, the user can click the Forgot Password? link on the login screen.

2. The Password Reset application starts. On the Identity page, the user identifies himself or herself by entering a Username.

3. On the Verify page, the user proves that they are the person who is associated with the username. In this example, the user enters the email address that is associated with the user profile. The admin can configure a different verification method or can require additional verifications, for example, a personal question that only the user can answer.

4. The Reset page tells the user to check email for instructions.
5. The user opens the email and clicks the here link to reset the password. The link is valid for a period that you specify (use the password_reset.request.expiry property).

Preview email

Hello

A password reset was requested for your user account on the ServiceNow instance https://demonightyplatformsecurity.service-now.com/.

Click here to reset your password. If you do not want to reset your password, please disregard this email.

The link will expire in 12 hours.
If you did not request this password reset, please notify your company's ServiceNow administrator.

6. The Reset Password page guides the user to reset the password.

The default self-service Password Reset process (com.glideapp.password_reset) defines:

- The URI that specifies where users are redirected when they click Forgot Password?. By default this value is /$pwd_reset.do?sysparm_url=ss_default, which is the same value used in the glide.security.password_reset.uri property. In previous releases, this value was set to /reset_password.do.
- The Enable Password Reset URL option, which specifies that the user should receive an email with a link to reset their password after they click Forgot Password?.
- The Personal Data Enter Email Address verification flow that specifies the three-step password reset flow.

See Configure your Password Reset process for instructions on accessing this form and configuring the fields.

Note:

- This feature works for locally authenticated users who enter the username and password specified in their user record. Users logging in to the instance via an SSO solution or an LDAP integration cannot reset passwords with self-service Password Reset.
- The end user must enable and configure notification preferences. See Subscription-based notifications on page 822. Administrators can modify the email that is sent to the end user.
Plan your Password Reset processes

To ensure security and efficiency, take the time to plan your Password Reset implementation.

Role required: password_reset_admin or admin

1. Decide on the password reset process:
   - Self-service process: Users reset their password over the Internet using a browser on any supported interface, including mobile devices. To make the Password Reset application with Orchestration available to all users publicly, create a new Password Reset process only for this purpose and make it accessible to all users by setting the Public access property. See Example: The default self-service Password Reset process on page 2133.
   - Service desk-assisted process: Users reset passwords by requesting the assistance of a service desk agent, over the phone or in person. Only service desk agents with the password_reset_service_desk role can reset user passwords. Watch the videos: Resetting User Passwords (Video) and How to Set Up a Service Desk-Assisted Password Reset Process (Video).

2. Decide how groups and roles differ in access and security needs.

Analyze and assess how members of each group in your organization access the system. For example, if members of the sales group primarily access the system remotely, consider using a stronger method or multiple methods to verify the identity of each user.

Identify user roles that have access to critical information and resources. For example, stronger verifications might be required for roles that have access to employee data, accounting information, or network configurations.

Based on your analysis of groups and roles, determine the number and variety of verifications needed for the different Password Reset processes.

3. Decide how to manage credentials.

Determine whether single sign-on is enabled with the type of directory service or other credential store used. If the directory service is configured for single sign-on, consider increasing the level of security by using multiple methods to verify identity of a user. A compromised user name and password can easily allow access to associated systems in a single sign-on environment.

4. Decide how to implement enrollment in the Password Reset program.

For example, will enrollment be optional or required? Will users be auto-enrolled? How will users be notified to enroll in the program? The answers to these questions will help you determine the appropriate verification types to use.

5. Decide which Password Reset options to offer to users.

   - If your organization uses single sign-on, how will users reset their password if they are unable to log on?
   - What options are available to users working off-site?

Configure your Password Reset process

To implement the process, you configure credentials, verification methods and settings, and enrollment settings. You also specify which users the process applies to.

Role required: password_reset_admin or admin

1. Be sure to Plan your Password Reset processes on page 2136.
2. Create the credential store record for usernames and passwords that are managed.

Note: For LDAP integrations: If the Active Directory settings require users to reset the password when logging in, the results depend on the Password Reset plugin that is installed.
• The Password Reset plugin cannot change an AD password. End users will not be able to log in to the instance.
• The Self Service Password Reset plugin depends on the Password Reset Basic plugin. Self service is intended for password reset only on the local ServiceNow instance and cannot change an AD password.
• The Password Reset Orchestration Add-on plugin is built on top of Orchestration AD activities. The plugin supports changing the AD password.

3. Define the verifications that the process will use.
4. Configure Password Reset to auto-enroll users or to enable users to enroll for the program. See Configure your Password Reset process to auto-enroll users on page 2160 and Enable users to enroll for Password Reset on page 2161.

A Password Reset process consists of the following elements:
• The credential store that contains user login credentials.
• Optionally, the user groups that are authorized to use the Password Reset process.
• The verifications that verify the identity of the requesting user and that enable the service desk agents to authorize reset of the password. (Verifications are implemented by script includes.)

1. Navigate to Password Reset Processes.
2. Click New and then specify a meaningful Name and Description for the process.
3. Select the Credential store that contains the user credentials that the process applies to.
4. Specify the process that you are defining: Select the Password Reset check box, the Password change check box or both check boxes.
5. Specify the Apply to all users setting.

<table>
<thead>
<tr>
<th>Setting of the Apply to all users check box</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selected</td>
<td>All users use the process that you are defining. This setting is useful only if all users have access to the authentication methods that are defined in this process.</td>
</tr>
<tr>
<td>Not selected</td>
<td>Only the users in the groups that you specify use the process. You specify the groups in the Groups related list.</td>
</tr>
</tbody>
</table>

6. For Password Reset, configure settings on the Password Reset Details tab.
Table 999: Settings on the Details tab

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public access</td>
<td>The check box is available only when Password reset is selected.</td>
</tr>
<tr>
<td></td>
<td>• Select the check box to enable a self-service process with public user access to the Password Reset or Password Change form through a URL.</td>
</tr>
<tr>
<td></td>
<td>• Clear the check box to define a Service desk-assisted process in which only service desk agents can reset a password at the request of a user.</td>
</tr>
<tr>
<td>Public URL</td>
<td>The field is available only when Public access is selected.</td>
</tr>
<tr>
<td></td>
<td>URL of the page where users go to reset or change the password. The value from the URL suffix field is appended to the URL when you tab out of the URL suffix field. For the Default self-service Password Reset process, this value must be /$pwd_reset.do?sysparm_url=ss_default.</td>
</tr>
<tr>
<td>URL suffix</td>
<td>The field is available only when Public access is selected.</td>
</tr>
<tr>
<td></td>
<td>Suffix used to create a unique URL for the Password Reset or Password Change form.</td>
</tr>
<tr>
<td>Field</td>
<td>Value</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Display CAPTCHA</td>
<td>The check box is available only when Public access is selected. Select the check box to display a CAPTCHA on the user identification page. The Password Reset application uses Google reCAPTCHA as the default CAPTCHA service. See <a href="#">Configure Google reCAPTCHA for the password reset process</a> on page 2178. Note: The Password Reset Windows Application uses the base-system CAPTCHA service even if the Password Reset application is configured to use Google reCAPTCHA. Because on-premises instances do not have access to the Internet, the instances cannot use the Google reCAPTCHA service. Set the password_reset.captcha.google.enabled system property to false for on-premises instances. To use the CAPTCHA service that is provided with the base system, change the password_reset.captcha.google.enabled system property to false.</td>
</tr>
<tr>
<td>Identification type</td>
<td>Method that the user employs to claim identity for the public Password Reset or Password Change process. Any selection overrides the default identification that is associated with the process. The base system includes the Email and Username Identification identification types. You can create a custom identification type (some knowledge of JavaScript is recommended). See <a href="#">Personal data identification types and confirmation type verifications</a> on page 2157.</td>
</tr>
<tr>
<td>Field</td>
<td>Value</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Post-reset URL</td>
<td>URL to go to after a successfully resetting a password — typically, the URL of the original login page.</td>
</tr>
<tr>
<td></td>
<td>Enter a complete path, including the protocol (for example, <a href="https://myDomain.myURL.com">https://myDomain.myURL.com</a>). If the path is under the same domain as the Public URL, then start the path with the / character.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> If the Auto-generate password check box is selected, then the instance displays the new password. The user must click Done to go to the URL.</td>
</tr>
<tr>
<td>Minimum verifications</td>
<td>Number of verifications that a user must successfully submit to reset the password.</td>
</tr>
<tr>
<td></td>
<td>If the number exceeds the number of mandatory verifications, then the user must submit enough additional optional verifications to meet the number specified for Minimum verifications.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Each user must submit all mandatory verifications regardless of the number specified.</td>
</tr>
<tr>
<td></td>
<td>By default, during the password reset process, the system presents optional verifications to the user based on the Order values for the verifications. If you selected Allow user to choose from optional verifications, then the Verification page presents all optional verifications to the user. The user then selects the appropriate number of verifications. In this example, the Minimum verifications value is 1. Because no mandatory verifications are configured, the user can choose an optional verification.</td>
</tr>
<tr>
<td></td>
<td>Also, see Allow user to choose from optional verifications.</td>
</tr>
<tr>
<td>Field</td>
<td>Value</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Allow user to choose from optional verifications</td>
<td>Select the check box to enable a user, on the Verifications page during the process of resetting the password, to select which optional verifications to use. The choice of optional verifications appears only if the Minimum verifications setting is greater than the number of mandatory verifications. The number that you specify for Minimum verifications determines how many optional verifications that the user is allowed to select. In the example, the Minimum verifications setting is 2 and there are no mandatory verifications. The user has selected two optional verifications, so cannot select a third verification.</td>
</tr>
<tr>
<td>Email Password Reset URL</td>
<td>Select the check box to enable users to reset the password by clicking a link in an email that the instance sends to them. By default, the self-service Password Reset processes enable this option. When you select this option, the Auto-generate password check box is not available.</td>
</tr>
</tbody>
</table>

**Note:** See [Example: The default self-service Password Reset process](#) on page 2133 for an outline of the process that is enabled by default.
<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
</table>
| Enable account unlock | This check box is available only when Password reset is selected.  
Select the check box to allow user accounts on credential stores to be unlocked without resetting the password.  
**Note:** Not supported by the default self-service Password Reset process. |
| Unlock user account  | Select the check box to unlock user accounts on credential stores after a password reset. |
| Auto-generate password | Select the check box to auto-generate a new password for the user. When this check box is selected, you must select the Email password or Display password check box, or both. This setting is useful for service desk-assisted processes.  
This check box is available only when:  
- The Password reset check box is selected.  
- The Email Password Reset URL check box is cleared.  
**Note:** If you use the credential store on your local ServiceNow instance or an Active Directory credential store: Clear the check box to enable the Enforce history policy option for a credential store.  See *Configure the connection to a credential store for the Password Reset processes* on page 2148. |
<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>User must reset password</td>
<td>This check box is available only when Auto-generate password is selected. Select the check box to require users to reset their password immediately after logging in with the auto-generated password.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Users whose credentials are held in the local ServiceNow instance credential store are prompted to change their password the first time that they log in. Users whose credentials are held in an Active Directory credential store are not prompted to change their passwords in the instance. Such users must change their passwords from a computer on the domain.</td>
</tr>
<tr>
<td>Display password</td>
<td>This check box is available only when Auto-generate password is selected. Select the check box to display the new password on the screen. In a self-service process, the password appears on the user screen. In a service desk-assisted process, the password appears on the service desk agent screen.</td>
</tr>
<tr>
<td>Email password</td>
<td>This check box is available only when Auto-generate password is selected. Select the check box to email the new password to the user. The setting is useful in both self-service and service desk-assisted processes. The setting can add a layer of security by requiring that users access their email to view the password. In a service desk-assisted process, emailing the password to users ensures that only the user requesting the password reset can view the password.</td>
</tr>
</tbody>
</table>

### Table 1000: Related lists on the Details tab

<table>
<thead>
<tr>
<th>List</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verifications</td>
<td>One or more verifications that the Password Reset process uses. See <em>Password Reset verifications</em> on page 2155.</td>
</tr>
<tr>
<td></td>
<td>The Verifications related list is available only after the record has been saved.</td>
</tr>
</tbody>
</table>
## Table 1001: Advanced tab

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry UI macro</td>
<td>UI macro that displays a customized message to users when they access the initial Password Reset screen.</td>
</tr>
<tr>
<td>Success UI macro</td>
<td>UI macro that displays a customized message to users on the final Password Reset screen when their password is successfully reset.</td>
</tr>
<tr>
<td>Failure UI macro</td>
<td>UI macro that displays a customized message to users on the final Password Reset screen when their password reset fails.</td>
</tr>
<tr>
<td>Post reset script</td>
<td>Script include that performs actions after the Password Reset process completes whether the outcome is success or failure. For more information on customizing post processor scripts, see the Post reset script category as described in Password Reset extension script categories on page 2197.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Header UI macro</td>
<td>Macros that add a header or footer to customize the appearance of the pages that end users work in while resetting a password (the Identify, Verify, and Reset pages). See [Add a custom header or footer to the user pages for Password Reset](on page 2182).</td>
</tr>
</tbody>
</table>

8. For Password Reset, fill in any fields of interest on the Enrollment Reminder tab.
10. From the Password Reset Process Verifications related list, select one or more verifications. See [Password Reset verifications](on page 2155).
11. From the Password Reset Process Groups related list, select the user groups that will use the process that you are defining.
    The Password Reset Process Groups related list appears only if the Apply to all users check box is not selected.
12. Save the record and then select the Active check box to enable the Password Reset process that you configured. The check box is available only after the record has been saved.
13. Click Update.
14. Navigate to Password Reset Properties to set the properties that configure the Password Reset experience for end users.

**Credential stores for Password Reset**

Credential stores hold user information such as user names and passwords that can be used as login credentials. Examples include the User table [sys_user] or an Active Directory server.
Users with the password_reset_admin or password_reset_credential_manager role can create and modify connections to credential stores.

**Credential store types installed with the base system**

A credential store type is a set of workflows that specify how to connect to a credential store. Navigate to Password Reset Credential Stores to view the list of example credential stores that are based on the base-system types. The base system includes the following credential store types:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local ServiceNow Instance</td>
<td>Represents the current (local) ServiceNow instance.</td>
</tr>
<tr>
<td>AD Credential Store</td>
<td>Represents an Active Directory credential store. Installed with the Password Reset - Orchestration Add-on plugin.</td>
</tr>
<tr>
<td>Remote (SOAP) ServiceNow instance</td>
<td>Represents a remote ServiceNow instance. Installed with the Password Reset - Orchestration Add-on plugin.</td>
</tr>
</tbody>
</table>

**Remote credential stores**

A remote credential store refers to any credential store other than the local ServiceNow instance. Remote credential stores, such as Active Directory, manage user names and passwords outside of the local instance. A remote credential store can also be a remote ServiceNow instance, a UNIX or Linux server, or any other directory-like service that relies on the SOAP protocol. The Password Reset Orchestration Add-on plugin is required to connect to remote credential stores. Review the information in the section on credential store types before you create, test, or delete credential stores.

**Connection workflows for credential store types**

A credential store type workflow requires a subflow that defines how to connect to the store, and can include an optional subflow that defines how to test the connection. Use the Pwd reset – AD and Pwd Reset - Local subflows as models for your custom connection workflows.
Figure 408: Pwd Reset Local sub workflow
Creating a custom credential store type

You can use a credential store type as a model to create a custom type. See Create a credential store type for Password Reset on page 2188.

Configure the connection to a credential store for the Password Reset processes
You create a Password Reset credential store record to configure access to your credential store server while a user is changing or resetting a password. In addition to host connection information, you can specify the password hints that users should see, restrictions on password reuse, the allowed number of failed reset attempts, and other settings.

For an AD credential store, skip this procedure and instead follow the instructions in Integrate Password Reset with your Active Directory service on page 2150. The Password Reset Windows Application supports only AD credential stores.

1. Navigate to Password Reset Credential Stores.
2. Select one of the following sample credential stores:
   - Local ServiceNow Instance credential store.
   - Remote (SOAP) ServiceNow credential store (installed with the Orchestration Add-on).
3. Enter a unique and meaningful Name and Description, and then fill in the form.
<table>
<thead>
<tr>
<th><strong>Type</strong></th>
<th>Type of credential store that you are connecting to. A ServiceNow credential store type is a template that provides the required set of capabilities for a particular kind of credential store. Credential stores inherit the functionality of the credential store type.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Note:</strong></td>
<td>For an AD credential store, skip this procedure and see <em>Integrate Password Reset with your Active Directory service</em> on page 2150. The Password Reset Windows Application supports only AD credential stores.</td>
</tr>
</tbody>
</table>
| **Auto-generate password** | Script include that generates a temporary password for use during the reset process.  
If you select the Enforce history policy check box, then you must specify a value for Auto-generate password. |
| **Enforce history policy** | Appears only if you select a credential store Type of AD Credential Store or Local ServiceNow Instance. For information on configuring the setting for an AD credential store, see *Configure the connection to an AD credential store* on page 2151.  
Select the Enforce history policy check box to ensure that users do not reuse passwords. For example, you might configure the history policy to not allow the user to reuse any of the previous 10 passwords. Follow this procedure:  
1. Select the Enforce history policy check box.  
2. In the Password Reset Credential Store Parameters related list, create a password_history_limit parameter.  
3. Set the value of the parameter to the number of previous passwords that cannot be used (maximum 10). The default value of 0 (zero) enables use of any previous password. |
| **Hostname** | URL or IP address of the credential store. |
| **User account lookup** | Script include that maps the user ServiceNow platform ID to the user credential store ID. A default script, PwdDefaultUserAccountLookup, returns the user ServiceNow platform user name. |
| **Password rule hint** | Specify the text that appears on the password reset page to help the user to create a password that meets all requirements. The Password rule script enforces the requirements.  
**Note:** The Password Reset Windows Application supports newline characters in the hint. Other formatting is not supported (bold, underline, hyperlink, and so on). |
| **Password rule** | Specify the client script that validates the new password that the user enters. The script is invoked when the user enters a new password and clicks Password Reset. You can use the script to enforce password strength/complexity requirements. |
4. Click Submit.
5. If you use the Local ServiceNow Instance credential store and you selected the Enforce history policy check box, then follow these steps:
   a) Open the Password Reset process that is associated with the credential store: Password Reset Processes.
   b) On the Password Reset Details tab of the Password Reset Process form, clear the Auto-generate password check box and then save the process definition.

6. Test the connection to the credential store.

Integrate Password Reset with your Active Directory service
When the Orchestration Add-on plugin is activated, the Password Reset application can change passwords on an Active Directory credential store. The application changes passwords by referencing an Active Directory user role with the appropriate password change privileges.
Role required: admin

Active Directory must have a user role with the following privileges:

Descendent User objects:
- Reset password
- Read/Write pwdlastset
- Read/Write UserAccountcontrol
- Write Account Restrictions
- Read/Write lockouttime
- Read MemberOf

Descendent Group objects:
- Read Members
- Read MemberOf

1. **Install MID Server** on a Windows computer that can connect to Active Directory.
2. **Configure the MID Server.**
3. In the ServiceNow instance, navigate to Orchestration Credentials.
4. Click New, complete the form with the following values for the AD credential, and then click Submit.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Select Windows.</td>
</tr>
<tr>
<td>User name</td>
<td>Enter your Active Directory domain user. For example, domain \admin.</td>
</tr>
<tr>
<td>Password</td>
<td>Enter your Active Directory domain user password.</td>
</tr>
<tr>
<td>Applies to</td>
<td>Select the MID Server that is used to access the Active Directory server.</td>
</tr>
</tbody>
</table>

Create a connection to the credential store as described in Configure the connection to an AD credential store on page 2151.

### Configure the connection to an AD credential store

You create a Password Reset credential record to configure access to your Active Directory server while a user is changing or resetting a password. In addition to host connection information, you can specify the password hints that users should see, restrictions on password reuse, the allowed number of failed reset attempts, and other settings.

The Orchestration add-on installs the AD Credential Store type. The Password Reset Windows Application supports only AD Credential Store.

1. Navigate to Password Reset Credential Stores and select Sample AD Credential Store to use as a template.
2. Enter a unique and meaningful Name and Description and then fill in the form.

<p>| Type                      | Select AD Credential Store. A ServiceNow credential store type is a template that provides the required set of capabilities for a particular type of credential store. Credential stores inherit the functionality of the credential store type. |</p>
<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto-generate password</td>
<td>Specify a script include that generates a temporary password for use during the reset process.</td>
</tr>
<tr>
<td><strong>Note:</strong></td>
<td>If you select the Enforce history policy check box, then you must specify a value for Auto-generate password.</td>
</tr>
</tbody>
</table>
| Enforce history policy | Appears only if you select a credential store Type of AD Credential Store or Local ServiceNow Instance. For information on configuring the setting for credential store types other than AD, see Configure the connection to a credential store for the Password Reset processes on page 2148. Select the Enforce history policy check box to enforce both of the following password reset policies:  
  - History policy (password reuse): Active Directory domains can be configured to include a history policy that ensures that users do not reuse passwords. For example, the history policy might be configured to not allow the user to reuse any of the previous 10 passwords when resetting a password.  
  - Maximum number of reset attempts: You can configure the maximum number of attempts to reset a password. A user who fails to reset the password (by failing password policies or the history policy) the specified number of times is blocked.  

Follow this procedure to enforce the history policy that is configured for the AD credential store and to enforce the password policy:  
1. Select the Enforce history policy check box.  
2. In the Password Reset Credential Store Parameters related list, set the value of the max_reset_attempts parameter to the number of allowed attempts to change or reset the password. Attempts fail when password policies which are set up on the remote AD server. The max_reset_attempts setting applies only to Password Reset processes that use AD credential stores. The default value of 0 (zero) enables an unlimited number of reset attempts.  

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hostname</td>
<td>Specify the URL or IP address of the credential store.</td>
</tr>
<tr>
<td>User account lookup</td>
<td>Specify the script include that maps the user ServiceNow platform ID to the user credential store ID. The default script, PwdDefaultUserAccountLookup, returns the user ServiceNow platform user name.</td>
</tr>
</tbody>
</table>
| Password rule hint    | Specify the text that appears on the password reset page to help the user to create a password that meets all requirements. The Password rule script enforces the requirements.  
  **Note:** The Password Reset Windows Application supports newline characters in the hint. Other formatting is not supported (bold, underline, hyperlink, and so on). |
| Password rule         | Specify the client script that validates the new password that the user enters. The script is invoked when the user enters a new password and clicks Password Reset. You can use the script to enforce password strength/complexity requirements. |
Enable Password Strength

Select the check box to:

• Display the text box for the Strength rule script so you can update the script.
• Display the graphical Password Strength bar to the user while the user changes or resets the password.

**Note:** The Password Reset Windows Application does not support Password Strength.

Strength rule

This text box appears only if you select Enable Password Strength.

Specify the client script that calculates the strength/complexity of the password that the user enters. The script is invoked when the user begins to enter a new password during the reset process.

Default settings:

• Selected for local ServiceNow credential stores
• Not selected for other credential stores

**Note:**
To guide the user during the reset process, the system displays a graphical bar labeled Password Strength under the New password field.

**Note:** The Password Reset Windows Application does not support Password Strength.

3. Click Submit.
4. On the domain controller, set Password Aging (MIN_PASSWORD_AGE) to zero.
5. To enforce the history policy that is configured for the AD credential store, follow these steps:
   a) Open the Password Reset process that is associated with the credential store: Password Reset Processes.
   b) On the Password Reset Details tab of the Password Reset Process form, clear the Auto-generate password check box and then save the process definition.
   c) On the domain controller, set the history policy to twice the desired number of passwords. For example, to enforce that the last 11 passwords are not repeated, set the history policy to 22.

**Note:** To enforce the history policy that is configured for the AD credential store, the system auto-generates a new temporary password for each reset cycle. The system auto-generates the temporary password even though you cleared the Auto-generate password check box on the Password Reset Process form. Because the user immediately replaces
the temporary password with a new password, two passwords are created for each reset cycle.

6. To enforce the maximum number of attempts to reset the password: In the Password Reset Credential Store Parameters related list, set the value of the max_reset_attempts parameter to the number of allowed failed attempts. The default value of 0 (zero) enables an unlimited number of reset attempts.

   **Note:** The max_reset_attempts setting applies only to Password Reset processes that use AD credential stores.

7. Click Submit.

8. **Test the connection to the credential store.**

   **Test the connection to a credential store**
   You should test the connection to a credential store after you configure a new credential store or when users experience problems that might involve the connection.

   Role required: admin

   1. Navigate to **Password Reset Credential Stores** and then open the credential store record.
   2. In the header bar, click **Save and Test Connection**.
   
      A progress page displays the result of the test.

   **Set up SOAP credentials for Password Reset**
   When the Orchestration Add-on plugin is activated, the ServiceNow platform can use the SOAP protocol to interact with remote credential stores such as a remote ServiceNow instance.

   Role required: admin or web_service_admin

   1. Navigate to **System Web Services Outbound SOAP Message**.
   2. Click **Password Reset Request**.
   3. From the Soap Message Functions related list, configure both the password_reset and sys_user_get_record functions by completing the following steps.
      a) In Basic auth user ID, enter the user ID for the remote system user who has privileges to update records on the User [sys_user] table.
      b) In Basic auth user password, enter the password for the remote system user who has privileges to update records on the User [sys_user] table.
      c) Select Use basic auth.
      d) Click Update.

      You do not need to enter a value in the SOAP endpoint field. The field shows the name of the ServiceNow instance used for Password Reset.

   **Delete a connection to a credential store for Password Reset**
   Important: Before you delete the connection to a credential store, check all Password Reset processes to ensure that the credential store is not in use. If the credential store is being used by a process, update the process before deleting the credential store.

   Role required: password_reset_admin or password_reset_credential_manager

   1. Navigate to **Password Reset Credential Stores** and then select the check box for the credential store.
   2. In the Actions choice list, select **Delete**.
Password Reset verifications

Each verification specifies the method and process for verifying the identity of the user that is requesting password reset.

Verifications included with Password Reset

The Password Reset application includes the following verifications in the base system. You can create a verification based on either a base-system verification or a verification type (a template).

Note: The Password Reset Windows Application does not support custom verifications.

| QA verification | Implements a self-service Password Reset model with questions that are included with the base system or custom questions that the admin defines. While enrolling for the process, the user decides which questions to provide answers for. Questions are presented in the language that the user requested during login.

When a user requests password reset, the system poses a specified number of the questions that the user selected during enrollment. The user must answer all questions correctly to verify identity.

For information on the user enrollment experience, see Users: Enroll in the Password Reset program using questions and answers on page 2219.

This verification is based on the Security Questions verification type.
<table>
<thead>
<tr>
<th>Verification Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email verification</td>
<td>This verification relies on auto-generated code numbers. You typically implement Email verification as a self-service Password Reset model. When a user requests password reset, the system sends a verification code to an email address that the user authorized during enrollment. To verify identity, the user then submits the code on the Password Reset Verify page. For information on the user enrollment experience, see Users: Enroll in the Password Reset program using emailed codes on page 2220. The Password Reset Windows Application supports Email verification. This verification is based on the Email Code verification type.</td>
</tr>
<tr>
<td>SMS verification</td>
<td>Implements a self-service or service desk-assisted Password Reset model that relies on auto-generated code numbers. When a user requests password reset, the system sends a code to an SMS-capable device that the user has authorized. To verify identity, the user then submits the code on the Password Reset Verify page. You can use the ServiceNow Notify feature to send the codes. For information on the user enrollment experience, see Users: Enroll in the Password Reset program using SMS codes on page 2220. This verification is based on the SMS Code verification type.</td>
</tr>
<tr>
<td>Google Authenticator verification</td>
<td>Password Reset model that relies on auto-generated code numbers. You typically implement Google Authenticator verification as a self-service Password Reset model. When a user requests password reset, the user reads a code from the Google Authenticator app on a device that the user has paired. To verify identity, the user then submits the code on the Password Reset Verify page. For information on the user enrollment experience, see Users: Enroll in the Password Reset program using Google Authenticator on page 2221. The Password Reset Windows Application supports Google Authenticator verification. This verification is based on the Google Authenticator verification type.</td>
</tr>
<tr>
<td>Personal Data — Confirm Email Address</td>
<td>Implements a self-service Password Reset model that relies on user information that is available in the user profile on the instance. This verification is based on the Personal Data Confirmation verification type.</td>
</tr>
</tbody>
</table>
Verifications included with the demo data

The following demo data is based on the Mock verification type:

• Sample Mock verification #1
• #2

Personal data identification types and confirmation type verifications

Personal data verifications allow users to verify their identity by providing answers to questions that are generated from personal information stored in the User table [sys_user].

User experience

For an example of how a user might enroll for Personal data verification, see Users: Enroll in the Password Reset program using questions and answers on page 2219.

Personal data identification types

The Password Reset application provides the email and username identification types. You can use either type as provided or as a model to create a custom identification type.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email Identification</td>
<td>Identifies users by their email addresses.</td>
</tr>
<tr>
<td>Username Identification</td>
<td>Identifies users by their user names.</td>
</tr>
</tbody>
</table>

Personal data confirmation verifications

• Personal data verification: If users are associated with a Password Reset process that uses a personal data verification, the users are typically not required to enroll for Password Reset.
• Personal data confirmation verifications allow employees with the password_reset_service_desk role to access personal data from the sys_user table when assisting a user with a password reset request.

To configure personal data and personal data confirmation verifications, you specify parameters as name/value pairs that correspond to a particular piece of user information. For example, to verify users by their email address:

1. Set the label parameter (the text that the end user should see) to Email (that is, label=Email).
2. Set the column parameter (the column in the table that holds the verification data) to email (that is, column=email).

Note: You can use only one set of name/value pair parameters per verification. Additional parameters are ignored.
To use multiple pieces of personal information for user verification, create more personal data or personal data confirmation verifications and add the verifications to the related Password Reset process.

**Personal data and personal data confirmation type verifications**

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>label</td>
<td>Text to display as a label for the field that the user fills in during the password reset request. Data Type: string Default Value: n/a</td>
</tr>
<tr>
<td>column</td>
<td>Column of the sys_user table that provides the data that is used to verify the identity of the user. Data Type: string Default Value: n/a</td>
</tr>
</tbody>
</table>

*SMS Code Verification type for Password Reset*

Using the Simple Message Service (SMS) Code Verification type, a user can verify identity with the help of any SMS-enabled device, like a cell phone that accepts text messages. When a user requests password reset, the system sends a numerical code to the device and the user then enters the code on the Password Reset Verification page.

You can change the default behavior of an SMS code verification using either of the following methods:

- Set parameter values, as shown in the table.
- Update property settings for the Password Reset application.

**Note:** The system allows only one instance of each SMS code parameter.

<table>
<thead>
<tr>
<th>Parameter name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>expiry</td>
<td>Number of minutes the verification code is valid. Data Type: integer (any positive integer) Default Value: 5</td>
</tr>
<tr>
<td>complexity</td>
<td>Number of digits in the numerical verification code. Data Type: integer (any positive integer) Default Value: 4</td>
</tr>
<tr>
<td>pause_window</td>
<td>Number of minutes before the user can request another SMS code for verification. Data Type: integer (any positive integer) Default Value: 2</td>
</tr>
</tbody>
</table>
**User experience**

For information on how users enroll for SMS verification, see *Users: Enroll in the Password Reset program using SMS codes* on page 2220.

Use NotifyNow to send SMS codes for enrollment and verification

You can configure the Password Reset application to send SMS codes for enrollment and verification using the ServiceNow NotifyNow application (via the Twilio SMS Messaging system). NotifyNow is tightly integrated with the workflow engine and business rules and delivers a highly configurable and trusted way to deliver SMS messages.

Role required: admin

NotifyNow requires a separate contract with Twilio.

1. Enroll for a Twilio account and telephone number at [https://www.twilio.com/](https://www.twilio.com/)
2. Activate the Notify plugin.
3. Associate the Twilio account with Notify.

No other configuration is required. Users who request password change or password reset receive SMS codes through NotifyNow.

*Specify the number of required security questions*

When designing a Security Questions verification for Password Reset, you can specify the number of questions to display when users enroll. You can also specify the number to display when a user is verifying identity while resetting the password.

Role required: password_reset_admin or admin

1. Navigate to Password Reset Verifications and then open a verification that uses the Security Questions Verification Type.
2. Configure the parameters in the Password Reset Verification Parameters related list.

<table>
<thead>
<tr>
<th>Parameter name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>max_per_day</td>
<td>Maximum number of codes sent for verification in one day.</td>
</tr>
<tr>
<td></td>
<td>Data Type: integer (any positive integer)</td>
</tr>
<tr>
<td></td>
<td>Default Value: 10</td>
</tr>
</tbody>
</table>
Table 1004: Parameters for Security Questions Verification

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>num_enroll</td>
<td>Number of questions that a user must provide answers to while enrolling for the Password Reset process. The value that you specify here overrides the setting of the Number of security questions required during enrollment property. See Configure Password Reset properties on page 2164. Data Type: Positive integer that does not exceed the number of questions in the security questions list (Password Reset Security Questions). Default Value: 5</td>
</tr>
<tr>
<td>num_reset</td>
<td>Number of security questions that are displayed on the Verify page while a user is attempting to reset the password. The user must answer all questions correctly to verify identity. The questions are selected at random and are presented in random order. The value that you specify here overrides the setting of the Number of security questions required during the password reset request property. See Configure Password Reset properties on page 2164. Data Type: Positive integer that does not exceed the value of the num_enroll parameter Default Value: 3</td>
</tr>
</tbody>
</table>

3. Click Update.

Configure your Password Reset process to auto-enroll users

To simplify management, many organizations auto-enroll users in the Password Reset program. Every base-system verification type enables you to specify automatic enrollment for your process.

Role required: password_reset_admin or admin

To enable automatic enrollment, you configure settings for the verification type that your Password Reset process is based on.

1. Navigate to Password Reset Extensions Verification Types.
2. Click the verification type for the verification that your Password Reset process uses. The verification type for each base-system verification is identified in Password Reset verifications on page 2155.
3. On the Verification Types page, specify the following settings:
Enable users to enroll for Password Reset

To enable users to enroll for the Password Reset program, you specify a UI macro that takes the user through the enrollment process and a script that processes the enrollment data that the user entered. The base system includes a functioning macro and script.

Role required: password_reset_admin or admin

To enable users to enroll, you configure settings for the verification type that your Password Reset process is based on.

1. Navigate to Password Reset Extensions Verification Types.
2. Click the verification type for the verification that your Password Reset process uses. The verification type for each base-system verification is identified in Password Reset verifications on page 2155.
3. On the Verification Types page, specify the following settings:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automatic enrollment</td>
<td>Clear the check box to disable automatic enrollment.</td>
</tr>
<tr>
<td>Enrollment UI</td>
<td>Enrollment UI macro that takes the user through the enrollment process.</td>
</tr>
<tr>
<td>Enrollment processor</td>
<td>Enrollment processor script that processes enrollment data.</td>
</tr>
</tbody>
</table>

4. Repeat the procedure for all verifications that your Password Reset process uses.

**Enabling user enrollment**

This example verification type uses the pwd_enroll_sms_ui enrollment UI macro and the PwdEnrollSMSProcessor enrollment processor script.
A verification type must also define a verification UI macro and a corresponding verification processor script. The example uses the pwd_verify_sms_ui verification UI macro and the PwdVerifySMSProcessor verification processor script.

Figure 410: Verification type
**Figure 411: Verification UI macro**

```xml
<?xml version="1.0" encoding="utf-8" ?>
<j:jelly trim="false" xmlns:js="jelly:core" xmlns:g="glide" xmlns:j2="null" xmlns:g2="null">
<script language="javascript">
    addLoadEvent(getVerificationInfo);
    function getVerificationInfo() {
        var gc = new GlideAjax('PwdAjaxPublicEnrollSMS');
        gc.addParam('sysparm_name', 'getSMSVerificationInfo');
        gc.addParam('sysparm_user_id', 'sysparm_user_id');
        // add CSRF token for AJAX handling.
        gc.addParam('sysparm_pwd_csrf_token', findCERFElement().value);
        gc/XMLRequests('handleGetVerificationInfoResponse', null);
    }
    function handleGetVerificationInfoResponse(response, args) {
```
Configure Password Reset properties

You can specify properties that configure the Password Reset experience for end users.

Role required: password_reset_admin
While there are no range limits for the values you can enter for properties, consider using only positive integer values starting at 1. When you determine the limit for the upper range of a property, consider the task that the user is performing.

For example, you would not want to allow 100 attempts for users to verify their identity. A more common value is 3 attempts. Similarly, you may not want to force users who are completing the enrollment process to spend time selecting and answering 30 security questions. The more commonly used number of security questions is between 5 and 7.

1. Navigate to Password Reset Properties.
2. Update settings as needed and then click Save.

### Table 1005: Password Reset properties

<table>
<thead>
<tr>
<th>Property Label</th>
<th>Property Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Password Reset Global properties</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Email template for reminders to users</td>
<td>password_reset.enrollment_reminder.email_template</td>
<td>Email template to use for the email messages that remind users to enroll for the password reset process. See <a href="#">Send email to remind users to enroll for Password Reset</a> on page 2173.</td>
</tr>
<tr>
<td>Workflow polling frequency</td>
<td>password_reset.wf.refresh_rate</td>
<td>Time period in milliseconds between checks on status of the Password Reset workflow.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 500</td>
</tr>
<tr>
<td>Workflow expiration</td>
<td>password_reset.wf.timeout</td>
<td>Maximum wait time in milliseconds for the workflow to complete. The workflow is triggered during the password reset request when the user clicks Submit.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 90000</td>
</tr>
<tr>
<td>Property Label</td>
<td>Property Name</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------------</td>
<td>-------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Disable CAPTCHA validation functionality</td>
<td>password_reset.captcha.ignore</td>
<td>Enables or disables CAPTCHA functionality.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: false</td>
</tr>
</tbody>
</table>

The Password Reset application uses Google re-CAPTCHA as the default CAPTCHA service. To use the base system CAPTCHA, change the `password_reset.captcha.google.enabled` system property to false.
See Configure Google reCAPTCHA

### Password Reset Request properties

<table>
<thead>
<tr>
<th>Property Label</th>
<th>Property Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of unsuccessful attempts allowed to reset/change password</td>
<td>password_reset.request.max_attempt</td>
<td>Number of password reset attempts a user is allowed before they are locked out for a period determined by the value in <code>max_attempt_window</code>.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 3 (attempts)</td>
</tr>
<tr>
<td>Number of minutes a user must wait to reset/change password after exceeding the maximum allowed unsuccessful attempts</td>
<td>password_reset.request.max_attempt_window</td>
<td>Time period that users are blocked or prevented from changing their passwords after trying the maximum number of times.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 1440 (minutes)</td>
</tr>
<tr>
<td>Number of minutes a user must wait to reset/change password after the last successful reset/change</td>
<td>password_reset.request.success_window</td>
<td>Time period that a user must wait after successfully resetting the password to reset the password again.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 1440 (minutes)</td>
</tr>
<tr>
<td>Property Label</td>
<td>Property Name</td>
<td>Description</td>
</tr>
<tr>
<td>----------------</td>
<td>---------------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| Number of minutes a user must wait to start a reset request after the last successful unlock account | password_reset.request.unlock_window | Time period that a user must wait after a successful unlock operation before starting a new request.  
  - Type: integer  
  - Default value: 1440 (minutes) |
| Number of minutes before a password reset request expires | password_reset.request.expiry | Time period during which a user must perform the Password Reset process.  
  - Type: integer  
  - Default value: 10 (minutes) |

**Note:** This setting takes precedence over the glide.pwd_reset.onetime.token.validity property (that has a 12-hour default).

<table>
<thead>
<tr>
<th>Property Label</th>
<th>Property Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| Minimum number of characters in any answer | password_reset.qa.ans_min_len | Minimum number of alphanumeric characters that the user must enter in the answer text box for any security question.  
  Default value: 3 characters |
<table>
<thead>
<tr>
<th>Property Label</th>
<th>Property Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of security questions required during the password reset request</td>
<td>password_reset.qa.num_reset</td>
<td>Number of security questions that are displayed on the Verify page while a user is attempting to reset the password. The user must answer all questions correctly to verify identity. The questions are selected at random and are presented in random order.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 3 (questions)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Possible values: Integers that are less than the number specified for the Number of security questions required during enrollment property (the num_enroll parameter).</td>
</tr>
</tbody>
</table>

**Note:** You can override this property setting for a Password Reset process by configuring the num_reset parameter. See *Specify the number of required security questions* on page 2159.
<table>
<thead>
<tr>
<th>Property Label</th>
<th>Property Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of security questions required during enrollment</td>
<td>password_reset.qa.num_enroll</td>
<td>Number of questions that a user must provide answers to while enrolling for the Password Reset process.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Possible values: Integers that are greater than or equal to the number specified for the Number of security questions required during enrollment property (the num_reset parameter).</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> While attempting to verify identity, if a user answers a question incorrectly, the application refreshes with a random set of the specified questions in random order. You should, therefore, require more questions than specified for the Number of security questions required during enrollment property (the num_reset parameter).</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> You can override this property setting for a Password Reset process by configuring the num_enroll parameter. <strong>See Specify the number of required security questions on page 2169.</strong></td>
</tr>
<tr>
<td>Property Label</td>
<td>Property Name</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>--------------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| Password Reset SMS Code properties | **Maximum number of SMS codes sent for verification per day** | Maximum number of SMS codes that are sent to a user within one 24-hour period. The 24-hour period begins when a user clicks Send Code.  
  - Type: integer  
  - Default value: 10 (per day)  
  
  **Note:** You can override this SMS code property by adding the `max_per_day` parameter in the SMS code verification. |
| | **Number of minutes before the user can attempt to send another SMS code for verification** | Time that must pass before another SMS code can be sent to a user.  
  - Type: integer  
  - Default value: 2 (minutes)  
  
  **Note:** You can override this SMS code property by adding the `pause_window` parameter in the SMS code verification. |
| | **Number of digits in the SMS code sent to the user** | Number of characters required for a user to reset their password.  
  - Type: integer  
  - Default value: 4 (digits)  
  
  You can override this SMS code property by adding the `complexity` parameter in the SMS code verification. |
<table>
<thead>
<tr>
<th>Property Label</th>
<th>Property Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| Number of minutes before the SMS code expires | password_reset.sms.expiry | Time, in minutes, until the SMS code sent to the user expires.  
  - Type: integer  
  - Default value: 5 (minutes)  
  
  **Note:** You can override this SMS code property by the expiry parameter in the SMS code verification. |

**Password Reset Monitoring and Reporting properties**

| Time interval, in minutes, for counting blocked users | password_reset.activity_monitor.incident_window | Time window to count the number of blocked users.  
  - Type: integer  
  - Default value: 60 (minutes)  |

| Number of blocked users, in the defined time interval, that triggers a system log event | password_reset.activity_monitor.incident_threshold | Number of blocked (or locked) users, within the specified time window, that triggers a system log event.  
  - Type: integer  
  - Default value: 10 (blocked users)  |

**Password Reset Style Sheet**

| Style sheet to apply to end-user pages during the password reset process. | password_reset.stylesheet | Name of a custom CSS style sheet in the Style Sheet [content_css] table. You can use the default style sheet as a template for the custom style sheet. You cannot add element definitions to the style sheet.  
  - Type: string  
  - Default value: css_pwd_reset_default |
<table>
<thead>
<tr>
<th>Property Label</th>
<th>Property Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| Email template for reminder emails                                           | password_reset.email_template_default             | Template to use to specify the subject and body of the email messages to remind users to enroll for the Password Reset process. For example:  
• [Subject] Reminder: Enroll in the Password Reset program  
• [Body] Click here to enroll for the password reset service.  

**Note:** You must create an email template in the password_reset table to use it as a reminder.  
• Type: string  
• Default value: email_template_default

**Note:** Several components in the Self Service Password Reset (com.snc.password_reset) plugin and the Password Reset (com.glideapp.password_reset) plugin control the password reset flow. The following properties affect Password Reset, but do not appear on the Password Reset Properties page:  
• You can add the glide.pwd_reset.onetime.token.validity property to the System Properties [sys_properties] table to specify the number of hours that the Password Reset token should be valid. Default: 12.  

**Note:** The setting for the password_reset.request.expiry property (time period during which a user must perform the Password Reset process) takes precedence over the setting for glide.pwd_reset.onetime.token.validity.

Properties accessible from the System Properties [sys_properties] table:  
• For Password Reset on mobile devices, you can specify the URL that the user is taken to when user taps the Forgot password? button. See the glide.security.password_reset.uri property in High Security Settings. Default: /$pwd_reset.do?sysparm_url=ss_default  
• If glide.security.forgot_password.display.link is set to true, displays the Forgot Password? link on the login page.
Send email to remind users to enroll for Password Reset

You can automatically send messages that remind users to enrolled in the Password Reset process. You specify the text of the message and can configure the messages to repeat at intervals.

Role required: password_reset_admin

The default email content is:

- **Subject**: Reminder: Enroll in the Password Reset program
- **Body**: Click here to enroll in the Password Reset program.

To customize the email, see *Customize the Password Reset enrollment reminder email* on page 2174.

1. Navigate to Password Reset Processes and select your process.
2. Click the Enrollment Reminder tab, configure the following settings, and then click Update. (The tab appears only when the Password reset check box is selected.)

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Send reminder</td>
<td>Select the check box to send reminder emails to users (either all users or users in the specified groups, as you configured). Clear the check box to send no reminders.</td>
</tr>
<tr>
<td>Sender alias</td>
<td>Enter a non-functional email alias that should appear in both the To and From fields of the message. For example, <a href="mailto:do-not-reply@myCompany.com">do-not-reply@myCompany.com</a>. Users will not be able to respond to the alias. The alias is required by the email system to use the bcc field for all of the users who receive the message. The intent is that the users should not see the other addressees. Default: <a href="mailto:do-not-reply@ServiceNow.com">do-not-reply@ServiceNow.com</a></td>
</tr>
</tbody>
</table>
| Send, Day, and Time | Specify a schedule of one message each month or one message each week.  
  • If you set Send to Monthly, then enter the day of the month and optionally the time of day when the message should be sent.  
  • If you set Send to Weekly, then enter the day of the week and optionally the time of day when the message should be sent.  
  Default: Weekly message at 00:00 on Monday |
| Starting          | Date and time to send the first message. Click the calendar button to specify the setting. Default: [Now] |
Customize the Password Reset enrollment reminder email
The email message that reminds users to enroll for the Password Reset process is based on an email template. To customize the message, you can modify the default template or create a custom template.

Role required: password_reset_admin

The default email content is:

- Subject: Reminder: Enroll in the Password Reset program
- Body: Click here to enroll in the Password Reset program.

1. To modify the email subject text:
   a) Navigate to System Policy Email Templates.
   b) Open the Password reset enrollment reminder template.
   c) Update the Subject field as needed.
   d) In the Message HTML text box, you can add code as needed, but do not modify the default text.

2. To modify the email body content:
   a) Navigate to System Notifications Email Notification Email Scripts.
   b) Open the pwd.enrollment_reminder script.
   c) Modify only the indicated portion of the script.
3. To create a custom email template:
   a) Make a copy of the Password reset enrollment reminder template and edit as described above.

```javascript
function runMailScript(/* GlideRecord */ current, /*
TemplatePrinter */ template,

// Optional EmailOutbound w/ email,
// Optional
// GlideRecord w/ email_action,
// Optional GlideRecord w/ event) {

var board = "Password Reset Notification <do-not-reply@servicenow.com>;";
email.setFrom(board);
email.setReplyTo(board);

var users = event parm2.split(';');

//get user records
var user = new GlideRecord("sys_user");
user.addIndex("sys_id", users);
user.query();
while (user.next()) {
    var userContact = new GlideRecord("sys_user_contact");
    userContact.setSysId(user.getSysId());
    userContact.query();
    while (userContact.next()) {
        var enrollmentURL = gs.getProperty('glide.servlet.uri') + "$pwd_enrollment_form_container.do";
        template.print("Click <a href=" + enrollmentURL + ">here
</a> to enroll for the password reset service.");
    }
}
}(current, template, email, email_action, event);
```
b) Navigate to Password Reset Properties and enter the template name in the Email template for enrollment reminder emails field.

Configure the required strength for passwords

The password that a user defines must meet certain requirements — for example, it must contain at least 12 characters, it must include a numeral, and so on. You can configure the requirements as needed for your organization.

Role required: password_reset_admin

The base system includes example credential stores with various password requirements. You can modify password requirements and provide users with hints for creating a password. The default requirements are:

- At least eight characters
- At least one uppercase and one lower case letter
- At least one numeral

**Note:** In addition to configuring password strength requirements, you can configure several other settings for the credential store, as described in [Configure the connection to a credential store for the Password Reset processes](#) on page 2148.

1. Navigate to Password Reset Credential Stores.
2. Select the credential store in the list and then configure the following settings:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Password rule hint</td>
<td>Specify the text that appears on the password reset page to help the user to create a password that meets all requirements. The Password rule script enforces the requirements.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> The Password Reset Windows Application supports newline characters in the hint. Other formatting is not supported (bold, underline, hyperlink, and so on).</td>
</tr>
<tr>
<td>Password rule</td>
<td>Specify the client script that validates the new password that the user enters. The script is invoked when the user enters a new password and clicks Password Reset. You can use the script to enforce password strength/complexity requirements.</td>
</tr>
<tr>
<td>Enable Password Strength</td>
<td>Select the check box to:</td>
</tr>
<tr>
<td></td>
<td>• Display the text box for the Strength rule script so you can update the script.</td>
</tr>
<tr>
<td></td>
<td>• Display the graphical Password Strength bar to the user while the user changes or resets the password.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> The Password Reset Windows Application does not support Password Strength.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Strength rule   | This text box appears only if you select Enable Password Strength. Specify the client script that calculates the strength/complexity of the password that the user enters. The script is invoked when the user begins to enter a new password during the reset process. Default settings:  
- Selected for local ServiceNow credential stores  
- Not selected for other credential stores |

**Note:**

To guide the user during the reset process, the system displays a graphical bar labeled Password Strength under the New password field.

![Password Strength Image](image)

**Note:** The Password Reset Windows Application does not support Password Strength.

3. Click Submit. You should test the connection to a credential store after you configure a new credential store or when users experience problems that might involve the connection.

4. Navigate to Password Reset Credential Stores and then open the credential store.

5. In the header bar, click Save and Test Connection. A progress page displays the result of the test.

**Specify lockout for failed login attempts**

The system provides inactive script actions that enable you to specify the number of failed login attempts before a user account is locked and to reset the count after a successful login.

Role required: admin

Navigate to System Policy Script Actions to view or activate the scripts.

**Note:** Starting with the Kingston release, following a zBoot, the script actions SNC User Lockout Check with Auto Unlock and SNC User Clear are activated.
### Script action

<table>
<thead>
<tr>
<th>Script action</th>
<th>Description</th>
</tr>
</thead>
</table>
| SNC User Lockout Check with Auto Unlock           | • Uses the value of the glide.user.max_unlock_attempts property to set the limit for failed login attempts.  
  • Unlocks the user account after the time period that is specified for the glide.user.unlock_timeout_in_mins property. If no value is specified, then the system unlocks the user account after the default period of 15 minutes. |
| SNC User Lockout Check                            | Tracks the number of failed login attempts and locks the user account after a specified number of failed login attempts (default: 5).       |
| SNC User Clear                                    | Updates the user record after a successful login: Resets the number of failed login attempts and updates the date of the last login.        |

Each time a user attempts to log in, the action is recorded in an event log. You can view a log of failed login attempts.

1. Navigate to System Policy Event Logs.
2. Filter for login.failed in the Name field. You can view the attempted login name, date, and IP address logged for the attempt.

### Configure Google reCAPTCHA for the password reset process

To use the Google reCAPTCHA service, instances that are running on a domain other than service-now.com require an API key pair from Google.

**Role required:** admin

- The procedure described in this topic is optional for instances that are running on the service-now.com domain.
- Because on-premises instances do not have access to the Internet, they cannot use the Google reCAPTCHA service. Do not follow the procedure described in this topic. Instead, set the password_reset.captcha.google.enabled system property to false. This setting enables the CAPTCHA service that is provided with the base system.
- The Password Reset Windows Application uses the base-system CAPTCHA service even if the Password Reset application is configured to use Google reCAPTCHA.

1. Request an API key pair (a site key and a secret) from Google at https://www.google.com/recaptcha.
2. Set the following system properties:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>password_reset.captcha.google.enabled</td>
<td>Set to true.</td>
</tr>
<tr>
<td>Type: string</td>
<td>Default: true</td>
</tr>
<tr>
<td>Property</td>
<td>Value</td>
</tr>
<tr>
<td>-----------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>google.captcha.site_key</td>
<td>Set to the site key that Google provided.</td>
</tr>
<tr>
<td></td>
<td>Type: string</td>
</tr>
<tr>
<td></td>
<td>Default: A site key that Google provided to ServiceNow</td>
</tr>
<tr>
<td>google.captcha.secret</td>
<td>Set to the secret that Google provided.</td>
</tr>
<tr>
<td></td>
<td>Type: password2</td>
</tr>
<tr>
<td></td>
<td>Default: An encrypted secret that Google provided to ServiceNow</td>
</tr>
</tbody>
</table>

Settings on the Advanced tab of the Password Reset Processes form

UI macros and script includes can extend the basic functionality of a Password Reset process.
The Advanced tab appears when you are configuring a Password Reset process (Password Reset Processes).

Table 1006: Advanced tab

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry UI macro</td>
<td>UI macro that displays a customized message to users when they access the initial Password Reset screen.</td>
</tr>
<tr>
<td>Success UI macro</td>
<td>UI macro that displays a customized message to users on the final Password Reset screen when their password is successfully reset.</td>
</tr>
<tr>
<td>Failure UI macro</td>
<td>UI macro that displays a customized message to users on the final Password Reset screen when their password reset fails.</td>
</tr>
<tr>
<td>Post reset script</td>
<td>Script include that performs actions after the Password Reset process completes whether the outcome is success or failure. For more information on customizing post processor scripts, see the Post reset script category as described in Password Reset extension script categories on page 2197.</td>
</tr>
</tbody>
</table>
Customizing Password Reset processes

Password Reset scripts enable you to customize Password Reset by creating your own credential store, verification, and identification types, and extend them by defining extension scripts. You can also create a custom credential store type, custom verification type, or verification.

Password Reset scripting is available to users with the password_reset_admin role. The easiest way to customize Password Reset is:

1. Create custom types and scripts as described in Password Reset extension script categories on page 2197.

   Extension scripts are example script includes that enable you to extend functionality in a password reset process. The extension script category refers to the specific types of behavior for an extension script (for example, credential store, verification, identification type, or as a post-processor).

2. Follow the configuration steps described in Configure your Password Reset process on page 2136.

3. Select the new types that you created. You can customize the following components:
   - Credential store types: Define new types for how to connect to your credential stores by creating custom workflows for connection and testing. See Create a credential store type for Password Reset on page 2188.
   - Verification types: Define new types for how users are verified. See Create a custom Password Reset verification type on page 2184.
Identification types: Define new types for how users can identify themselves. See Create a custom identification type for Password Reset on page 2187.

Advanced password reset configuration

You can customize the Password Reset and Password Change applications to meet your organization's needs. See Password Reset and Password Change applications for more information. Also see Configure Password Reset properties on page 2164 for a list of properties that control several aspects of password reset.

Add a custom question to the Security Questions verification

To enroll for the 'Security Questions' verification, the user selects several questions and supplies confidential answers that only the user knows. You can add a custom question to the set of questions that are included with the base system.

Role required: password_reset_admin or admin

The base system provides a large set of default questions in all supported languages. Questions are presented to each user in the language that the user requested during login. Creating a custom English language question is a one-step process. To create a custom question in a non-English language, you can use either of the following options:

- Create a custom question in the non-English language.
- Create a custom English-language question plus one or more translations of the question into other languages.

1. Navigate to Password Reset Security Questions.

   **Note:** Each question in the list is presented to users when they enroll for the Password Reset process. The user selects each question to use by providing a confidential answer to the question.

2. Follow this procedure to create a custom question in a single language.

   **Note:** To enter non-English question text, you must request the language when logging in.

   a) On the Password Reset Questions page, click New.
   b) Enter the text in the Question (Translated field) field and then click Submit.

   The question is added to the list of questions that is presented to users when they enroll. No additional steps are needed and you can skip the remaining steps.

3. Follow this procedure to create a custom question in English and the same question in one or more other languages:

   a) Click New, enter English language text in the Question (Translated field) field, and then click Submit.
   b) Create a record in the sys_translated table for the non-English language question. Details appear at Translated Name / Field table and Languages table.

<table>
<thead>
<tr>
<th>Field (translate)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Label (translate)</td>
<td>Non-English equivalent of the English text in the Value field.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
</tr>
<tr>
<td>Element</td>
<td>Name of the field in the Password Reset Question [pwd_question] table: question_translated</td>
</tr>
<tr>
<td>ID</td>
<td>Two-character ISO 639.2 code for the language.</td>
</tr>
<tr>
<td>Table</td>
<td>Table that you are adding the translated question to: the Password Reset Question [pwd_question] table.</td>
</tr>
<tr>
<td>Language</td>
<td>Language name.</td>
</tr>
<tr>
<td>Value</td>
<td>English-language question that you added in the Security Questions table.</td>
</tr>
</tbody>
</table>

c) Repeat the process for each language that users might request.

Add a custom header or footer to the user pages for Password Reset

You can specify UI macros that add a header or footer to the pages that end users work in while resetting a password (the Identify, Verify, and Reset pages).

Role required: password_reset_admin

1.  Configure a UI macro for the header or footer: Navigate to  System UI UI Macros , click New, and then enter a meaningful Name and Description.

2.  In the XML text box, enter the macro text. The example macro adds the text "Trust Acme to Deliver!" to the footer of the page that users work in while resetting a password.
3. Select the Active check box and then click Submit.

4. Navigate to Password Reset Processes and select the process to update.

5. On the Advanced tab, click

   ( )

   for the Header UI macro or Footer UI macro and select the macro that you created.

6. Click Save.

7. Verify the appearance of the end-user pages.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>If the reset pages are Public Access</td>
<td>On the Password Reset Details tab, click the Public URL.</td>
</tr>
<tr>
<td>If the reset pages are not Public Access</td>
<td>Log in as an end user and request password reset.</td>
</tr>
</tbody>
</table>

Create a Password Reset verification from an existing verification

The Password Reset application includes several example verifications that you can use as they are or as the basis for a custom verification. If the verification types in the base system do not meet your needs, you can create a custom verification type.
Role required: password_reset_admin

**Note:** The Password Reset Windows Application does not support custom verifications.

1. Navigate to Password Reset Verifications and select a verification.
2. If needed, modify the parameters on the Password Reset Verification Parameters tab. The parameters are described in the instructions for the type of verification that you are working on.
3. Click Submit.
4. Each verification type has properties that control the user experience. Review the property settings and update as needed.

Create a custom Password Reset verification type

Each verification in Password Reset is based on the settings for a verification type. If the verification types in the base system do not meet your needs, you can create a custom verification type.

Role required: password_reset_admin or admin

Review the verification types that are provided in the base system to determine whether to create a custom verification type. Then review the verification type components to develop.

1. Navigate to Password Reset Extensions Verification Types.
2. Click New, enter a unique and meaningful Name and Description, and then fill in the form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrollment check</td>
<td>Script that determines whether a user is enrolled for verification. Automatic enrollment requires an enrollment check. If no script is specified when Automatic Enrollment is selected, a default script is provided.</td>
</tr>
<tr>
<td>Automatic enrollment</td>
<td>Select the check box to auto-enroll users. If Automatic enrollment is not selected, then you must provide an enrollment UI macro and enrollment processor script.</td>
</tr>
<tr>
<td>Enrollment UI</td>
<td>Enrollment UI macro that provides the UI for the enrollment.</td>
</tr>
<tr>
<td>Enrollment processor</td>
<td>Enrollment processor script that processes the enrollment.</td>
</tr>
<tr>
<td>Verification UI</td>
<td>Verification UI macro that provides the UI for the verification.</td>
</tr>
<tr>
<td>Verification processor</td>
<td>Verification processor script (extension scripts) that processes the verification.</td>
</tr>
</tbody>
</table>

3. Click Submit.

Create a custom Password Reset verification

Use a verification type in the base system as a template to design a custom verification. The Password Reset Windows Application does not support custom verifications.

Role required: password_reset_admin
Table 1007: Verification types in the base system

<table>
<thead>
<tr>
<th>Verification type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Data Confirmation</td>
<td>Verifies user identity using data from the User [sys_user] table. The user data is displayed to a service desk agent. The agent verifies the data. Enrollment is not required for this type. Recommended for service desk-assisted processes.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> The Password Reset Windows Application does not support the Personal Data Confirmation Verification type.</td>
</tr>
<tr>
<td></td>
<td>See <a href="#">Personal data identification types and confirmation type verifications</a> on page 2157.</td>
</tr>
<tr>
<td>Personal Data</td>
<td>Verifies user identity using data from the User [sys_user] table. The user is required to answer questions. Enrollment is not required for this type.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> The Password Reset Windows Application allows you to define and use multiple verifications of the Personal Data type.</td>
</tr>
<tr>
<td></td>
<td>See <a href="#">Personal data identification types and confirmation type verifications</a> on page 2157.</td>
</tr>
<tr>
<td>Email Code</td>
<td>When a user requests password reset, the system sends a verification code to the email address in the user profile or to an email address that the user authorized during enrollment. To verify identity, the user then submits the code on the Password Reset Verify page.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> The Password Reset Windows Application allows you to define and use multiple verifications of the Email Code type.</td>
</tr>
<tr>
<td></td>
<td>See <a href="#">Personal data identification types and confirmation type verifications</a> on page 2157.</td>
</tr>
<tr>
<td>Google Authenticator</td>
<td>While requesting password reset, the user reads a code from the Google Authenticator app on a device that the user has paired. To verify identity, the user then submits the code on the Password Reset Verify page.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> The Password Reset and Password Reset Windows Application support only a single verification of the SMS Code type.</td>
</tr>
<tr>
<td>Verification type</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| Security Questions | Verifies user identity by presenting personal security questions that the user must answer correctly.  
  **Note:** The Password Reset and Password Reset Windows Application support only a single verification of the Security Questions type.  
  See [Add a custom question to the Security Questions verification](#) on page 2181. |
| SMS Code | When a user requests password reset, the system sends a code to an SMS-capable device that the user has authorized. To verify identity, the user then enters the code on the Password Reset web page.  
  **Note:** The Password Reset and Password Reset Windows Application support only a single verification of the SMS Code type.  
  See [SMS Code Verification type for Password Reset](#) on page 2158. |
| Mock | Not a functional identity verification. Demonstrates how to add a verification type in a Password Reset process.  
  **Note:** The Password Reset Windows Application does not support the Mock verification type.  
  - The enrollment UI macro for this verification gets the user input and returns the entered value in the enrollment processor.  
  - The Password Reset UI macro for this verification gets input from the user and returns the entered value through the verification processor. |

1. Navigate to **Password Reset Extensions Verification Types**.
2. Click New, enter a unique and meaningful Name and Description, and then fill in the form.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Create verifications based on one of the verification types in the base system. Password Reset supports the following types. You can create multiple instances of any type.</td>
</tr>
</tbody>
</table>
|                              | • Personal Data Confirmation Verification  
• Personal Data Verification  
• Security Question Verification  
• SMS Code Verification                                                                                                                                                                        |
| The Password Reset Windows Application supports the following types:  
• Personal Data Verification. You can create only a single instance.  
• Security Question Verification. You can create multiple instances.  
• SMS Code Verification. You can create only a single instance.  |
| Order                        | Position of the verification as it appears on the Enrollment form and Password Reset form.                                                                                                                                                         |
| Password Reset Verification  | Parameters used by a verification to configure specific behaviors, like number of questions required to enroll, request expiration time, and columns used. Set parameters for any behavior that should be different from the value that is specified in the Password Reset properties.                               |
| Parameters                   | The available parameters are described separately for each verification type.                                                                                                                                                                             |

3. Click Submit.  
4. Each verification type has properties that control the user experience. Review the property settings and update as needed.

Create a custom identification type for Password Reset

A custom identification type enables the user to enter alternative verification information such as an employee ID while resetting the password.  
Role required: password_reset_admin or admin

1. Navigate to Password Reset Extensions Identification Types.  
2. Click New, enter a unique and meaningful Name and Description, and then fill in the form.  

| Identification field label | Text to display as a label for the Identification field.  
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification processor</td>
<td>Identification processor script. Choose an existing script or create your own using the Identification form processor category (extension script).</td>
</tr>
</tbody>
</table>

3. Click Submit.
Create a credential store type for Password Reset

You can create a custom credential store type if the base-system types do not meet your needs.

Role required: password_reset_admin or password_reset_credential_manager

1. Navigate to Password Reset Extensions Credential Store Types.
2. Click New, enter a unique and meaningful Name and Description, and then fill in the form.

**Note:** You may need to configure the form to see the Get user lock state workflow and the Unlock user workflow.

### Table 1008: New credential store fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Password Reset workflow</td>
<td>Subflow that defines the credential store processing. Password Reset workflows are available to use as a model. Provide scripts for each of the activities defined for the subflow. For more information about how to create a workflow, see Create a workflow on page 3222. For installed workflows, see Installed with Password Reset on page 2112.</td>
</tr>
<tr>
<td>Connection test workflow</td>
<td>Subflow that defines how to test the connection. Connection test workflows are available to use as a model. If you create a connection test subflow, provide scripts for each of the activities defined for the subflow. For installed workflows, see Installed with Password Reset on page 2112.</td>
</tr>
<tr>
<td>Get user lock state workflow</td>
<td>Subflow that defines how to get the user lock state. Get user lock state workflows are available to use as a model. Provide scripts for each of the activities defined for the subflow. For more on how to create a workflow, see Create a workflow on page 3222. For installed workflows, see Installed with Password Reset on page 2112.</td>
</tr>
<tr>
<td>Unlock user workflow</td>
<td>Subflow that defines how to unlock a user. Unlock user workflows are available to use as a model. If you create a connection test subflow, provide scripts for each of the activities defined for the subflow. For installed workflows, see Installed with Password Reset on page 2112.</td>
</tr>
</tbody>
</table>

3. Click Submit.
Password Reset script includes

The Password Reset plugin installs script includes that implement password reset processes. To enable you to extend functionality, each base-system script include provides extension points that you can use to invoke "extension scripts" that you customized.

The extension script category refers to the specific types of behavior for an extension script (for example, credential store, verification, identification type, or as a post-processor).

'Enrollment check' script includes

All enrollment check script includes take the following parameters and return a boolean indicating whether the user is enrolled for Password Reset.

- params.userId: The sys_id of the user being checked (table: [sys_user]).
- params.verificationId: The sys_id of the verification being checked (table: [pwd_verification]).

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PwdAlwaysEnrolled</td>
<td>Default check of whether a user is enrolled that always returns true.</td>
</tr>
<tr>
<td>PwdMockIsEnrolled</td>
<td>Default check of whether a user is enrolled that always returns true.</td>
</tr>
<tr>
<td>PwdQuestionsEnrollmentCheck</td>
<td>Determines whether a user has enrolled for Password Reset using security question verification.</td>
</tr>
<tr>
<td>PwdSMSEnrollmentCheck</td>
<td>Determines whether a user has enrolled for Password Reset using SMS verification.</td>
</tr>
</tbody>
</table>

'Identification form processor' script includes

Identification form processor script includes provide functionality for extending identification processing.

All identification form processor script includes take the following parameters, and return the sys_id of the user that corresponds to the requested input. If the user was not identified, it returns null.

- params.processId: The sys_id of the calling Password Reset process (table: [pwd_process]).
- param request: The form request object. Fields in the form can be accessed with request.getParameter('<element-id>'). The supported request parameter is sysparm_user_id, the user identifier value entered in the form.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PwdIdentifyViaEmail</td>
<td>Verifies a user's identity by checking the email address.</td>
</tr>
<tr>
<td>PwdIdentifyViaUsername</td>
<td>Verifies a user's identity by checking the user name.</td>
</tr>
</tbody>
</table>
'Enrollment form processor' script includes

Enrollment form processor script includes provide functionality for extending enrollment form processing. All enrollment form processor script includes take the following parameters, and return a boolean indicating whether the user was successfully enrolled.

- params.userId: The sys_id of the user trying to enroll (table: [sys_user]).
- params.verificationId: The sys_id of the verification used to enroll (table: [pwd_verification]).
- params.enrollmentId: The sys_id of this enrollment process.
- request: The form request object. Fields in the form can be accessed with request.getParameter('<element-id>').

You should add the following information to the state of the enrollment process:

- gs.getSession().putProperty("result.status",status): Whether the user was successfully enrolled.
- gs.getSession().putProperty("result.message",message): An associated message to be returned to the UI, such as a detailed error message.
- gs.getSession().putProperty("result.value",value): A custom value associated with the enrollment.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PwdEnrollQuestionsProcessor</td>
<td>Handles questions and answers for verification.</td>
</tr>
<tr>
<td>PwdEnrollSampleProcessor</td>
<td>Provides an enrollment processor for sample verification.</td>
</tr>
<tr>
<td>PwdEnrollSMSProcessor</td>
<td>Provides an enrollment processor for SMS verification.</td>
</tr>
</tbody>
</table>

'User account lookup' script includes

User account lookup script includes return the credential store account_id for a given user. The following parameter returns the credential store account_id for a given user.

- params.userId: The sys_id of the user being checked (table: [sys_user]).

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PwdDefaultUserAccountLookup</td>
<td>Provides a default script for user account lookup from a user_id to the account in a credential store. The default mapping is to use the user name as the account name.</td>
</tr>
</tbody>
</table>

'Password generator' script includes

Password generator script includes take the following parameter, and return an auto-generated string password.

- params.credentialStoreId: The sys_id of the calling Password Reset process (table: [pwd_process]).
### 'Verification processor' script includes

If the user identity is verified, the verification processor script includes return `true`.

Verification processor script includes take the following parameters:

- `params.resetRequestId`: The sys_id of the current Password Reset request (table: `[pwd_reset_request]`).
- `params.userId`: The sys_id of the user to be verified (table: `[sys_user]`).
- `params.verificationId`: The sys_id of the verification (table: `[pwd_verification]`).
- `request`: The form request object. Access the fields in the form with `request.getParameter('<element-id>')`.

### Name | Description
--- | ---
PwdDefaultAutoGenPassword | Generates a password from a random word and 4 digits.

### 'Post processor' script includes

Post processor script includes execute custom actions after the Password Reset process has completed.

All post processor script includes take the following parameters.

- `params.resetRequestId`: The sys_id of the current Password Reset request (table: `[pwd_reset_request]`).
- `params.wfSuccess`: A flag indicating whether the workflow completed successfully: `True` if, and only if, successful.

### Name | Description
--- | ---
PwdPostProcessor | Executes actions after the process completes for success, failure, or both conditions.

---

**Example custom scripts for Password Reset**

The example scripts perform a user account lookup and processes an identification form, define a credential store, and create an identification type.
Perform a user account lookup and process an identification form

The main script calls two extension scripts, one to perform the user account lookup, and the other to process the identification form.

```javascript
// User account lookup
var lookupExtensionSysId =
  getExtensionScriptSysId('SampleUserAccountLookupExtension', 'user_account_lookup');
var lookupExtension = new SNC.PwdExtensionPoint(lookupExtensionSysId);

// Setup parameters required for this extension type - userId
var params = new SNC.PwdExtensionPointParameter();
params.userId = 'joe.employee';

// Invoke the extension
var answer = lookupExtension.process(params);
gs.print('user: ' + answer);

// Form processor sample - Identification form processor
var identExtensionSysId =
  getExtensionScriptSysId('SampleIdentificationProcessorExtension', 'identification_form_processor');
var identificationExtension = new SNC.PwdExtensionPoint(identExtensionSysId);

// Setup parameters required for this extension type - processId
var params = new SNC.PwdExtensionPointParameter();
params.processId = 'pwdreq1234';

// Simulate the posted form parameter for the identification processor
var request = new SNC.PwdExtensionPointParameter(); // A real life case will inject its own request object
  request.setParameter('sysparm_user_id', 'joe.employee');

var userIdentity = identificationExtension.processForm(params, request);
gs.print('identity: ' + userIdentity);
```

Define a credential store

The following is an example of an extended process function in the User Account Lookup category used to define a credential store. To create this extension script, go to Password Reset Extensions New extension script and create a new script as described in Create an Extension Script. To configure the User Lookup in a Password Reset process, see Credential Stores.

```xml
<?xml version="1.0" encoding="UTF-8"?>
```
* Returns the credential-store account id for a given user
* @param params.userId The sys-id of the user being checked (table: sys_user)
* @return The credential-store account-id (string) for a given user
*/
process: function(params) {
  return params.userId;
},

type: 'SampleUserAccountLookupExtension'
Create an identification type

The following is an example of an extended processForm function in the Identification Form Processor category that can be used to create an identification type. To create this extension script, go to Password Reset Extensions New extension script and create a new script as described in Create an Extension Script.

```xml
<?xml version="1.0" encoding="UTF-8"?>
<record_update table="sys_script_include">
    <sys_script_include action="INSERT_OR_UPDATE">
        <active>true</active>
        <client_callable>false</client_callable>
        <description>Script that processes an identification form.\nReturns the sys-id of the user that corresponds to the requested input; if no user was found, null should be returned.\n</description>
        <name>SampleIdentificationProcessorExtension</name>
        <script><![CDATA[
var SampleIdentificationProcessorExtension = Class.create();
SampleIdentificationProcessorExtension.prototype = {
    category: 'password_reset.extension.identification_form_processor', // DO NOT REMOVE THIS LINE!

    processForm: function(params, request) {
        var sysparm_user_id = request.getParameter('sysparm_user_id');
        return sysparm_user_id + '_' + params.processId;
    },

    type: 'SampleIdentificationProcessorExtension'
};]]></script>
    </sys_script_include>
</sys_script_include>
```

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Use the process and processForm extensions

This example shows a script that uses two sample extensions, one process extension and one processForm extension.

```java
// User account lookup var lookupExtensionSysId =
  getExtensionScriptSysId('SampleUserAccountLookupExtension','user_account_lookup');
var lookupExtension =new SNC.PwdExtensionPoint(lookupExtensionSysId);

// Setup parameters required for this extension type - userId
var params =new SNC.PwdExtensionPointParameter();
params.userId='joe.employee';

// Invoke the extension var answer = lookupExtension.process(params);
gs.print('user: '+ answer);

//Form processor sample - Identification form processor
var identExtensionSysId =
  getExtensionScriptSysId('SampleIdentificationProcessorExtension','identification_form_processor');
var identificationExtension =new SNC.PwdExtensionPoint(identExtensionSysId);

// Setup parameters required for this extension type - processId
var params =new SNC.PwdExtensionPointParameter();
params.processId='pwdreq1234';

// Simulate the posted form parameter for the indentification processor
var request =new SNC.PwdExtensionPointParameter();// A real life case will inject it's own request object
request.setParameter('sysparm_user_id','joe.employee');

var userIdentity = identificationExtension.processForm(params, request);
gs.print('identity: '+ userIdentity);
```

```
function getExtensionScriptSysId(scriptName, category){
var result;var gr =new GlideRecord('sys_script_include');
gr.addQuery('name', scriptName);
gr.addQuery('script','CONTAINS','category: \"password_reset.extension.\"');
gr.addQuery('script','CONTAINS',category +\"\"');
gr.query();

if(gr.next()){
    result = gr.getValue('sys_id');
}
return result;}
```
<?xml version="1.0" encoding="UTF-8"?>
<record_update
    table="sys_script_include">
    <sys_script_include
        action="INSERT_OR_UPDATE">
        <active>true</active>
        <client_callable>false</client_callable>
        <description>
            Simple account lookup that returns the supplied user id
        </description>
        <name>SampleUserAccountLookupExtension</name>
        <script><![CDATA[
            var SampleUserAccountLookupExtension = Class.create();
            SampleUserAccountLookupExtension.prototype={
                category:'password_reset.extension.user_account_lookup',// DO NOT REMOVE THIS LINE!
                process:function(params){return params.userId;},
                type:'SampleUserAccountLookupExtension'
            }
        ]]]>
    </sys_script_include>
</record_update>

<?xml version="1.0" encoding="UTF-8"?>
<record_update
    table="sys_script_include">
    <sys_script_include
        action="INSERT_OR_UPDATE">
        <active>true</active>
        <client_callable>false</client_callable>
        <description>
            Script that processes an identification form.
            Returns the sys-id of the user that corresponds to the requested input; if no user was found, null should be returned.
        </description>
        <name>SampleIdentificationProcessorExtension</name>
        <script><![CDATA[
            var SampleIdentificationProcessorExtension = Class.create();
            SampleIdentificationProcessorExtension.prototype={
                category:'password_reset.extension.identification_form_processor',// DO NOT REMOVE THIS LINE!
                processForm:function(params){return params.user;},
            }
        ]]]>
    </sys_script_include>
</record_update>
**Password Reset extension script categories**

You can use a custom extension script to extend Password Reset functionality for credential store, verification, or identification types.

---

**Note:** To use a script include as an extension script, you must set it to Active status.

---

**Password Reset extension script categories**

Extension scripts must specify a category that indicates which script include is being extended, for example, category: 'password_reset.extension.enrollment_check'. The ServiceNow platform installs several scripts in each category. A script in the Enrollment check category can perform the enrollment check for a verification. Detailed information on each extension script appears in *Password Reset extension scripts* on page 2198.
<table>
<thead>
<tr>
<th>Extension script category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrollment check</td>
<td>Defines how to check that a user is enrolled in the Password Reset process. Scripts of this category are available in the Enrollment check field when you define a verification type (Password Reset Verification Type form).</td>
</tr>
<tr>
<td>Enrollment form processor</td>
<td>Defines how an enrollment form is processed (if automatic enrollment is not configured). Scripts of this category are available in the Enrollment form processor field when you define a verification type (Password Reset Verification Type form).</td>
</tr>
<tr>
<td>Identification form processor</td>
<td>Defines how a user identification is processed. Scripts of this category are available in the Identification processor field when you define a verification type (Password Reset Identification Type form).</td>
</tr>
<tr>
<td>Password generator</td>
<td>Defines how to generate a password. Scripts of this category are available in the Auto generate password field when you configure a credential store (Password Reset Credential Store Type form).</td>
</tr>
<tr>
<td>Post reset script</td>
<td>Executes at the end of a Password Reset process. Scripts of this category are available in the Post reset script field when you configure a process (Password Reset Process form).</td>
</tr>
<tr>
<td>User account lookup</td>
<td>Defines how to look up a user account. Scripts of this category are available in the User account lookup field when you configure a credential store (Password Reset Credential Store form).</td>
</tr>
<tr>
<td>Verification form processor</td>
<td>Defines how a verification form is processed. Scripts of this category are available in the Verification processor field when you define a verification type (Password Reset Verification Type form).</td>
</tr>
</tbody>
</table>

**Password Reset extension scripts**

Extension scripts allow you to extend Password Reset functionality in credential store, verification, or identification types.

**Password Reset extension script includes**

Each script include is associated with a specific category, which is available in the appropriate field of a Password Reset form.

**Note:** Create extension scripts only from the Password Reset Extension Script form (Password Reset Extensions New extension script). Extension scripts are special purpose script includes that are not created in the System Definition Script Includes interface. To use a script include as an extension script, you must set it to Active status.
'Enrollment Check' script include category

<table>
<thead>
<tr>
<th>Script include category</th>
<th>Description</th>
<th>Method signature</th>
<th>Input fields</th>
<th>Output fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrollment Check</td>
<td>Checks whether a user is enrolled for a given verification.</td>
<td>process(params)</td>
<td>Parameters:</td>
<td>Returns: (boolean)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• params.userId - The sys_id of the user to check (table: sys_user).</td>
<td>true, if the user is enrolled in the specified verification; otherwise, false.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• params.verificationId - The sys_id of the verification to check (table: pwd_verification).</td>
<td></td>
</tr>
</tbody>
</table>

This Enrollment Check example signals that the user is enrolled if both expected parameters are supplied. The code would be contained in the Script field of an extension script named SampleEnrollmentCheck:

```javascript
var SampleEnrollmentCheck = Class.create();
SampleEnrollmentCheck.prototype = {
  category: 'password_reset.extension.enrollment_check', // DO NOT REMOVE THIS LINE!

  /**
   * Returns boolean telling whether the user is enrolled.
   * This sample returns true if both parameters are supplied, false otherwise
   *
   * @param params.userId         The sys-id of the user being checked (table: sys_user)
   * @param params.verificationId The sys-id of the verification being checked (table: pwd_verification)
   * @return Boolean indicating whether the user is enrolled into the specified verification
   */
  process: function (params) {
    return (params.userId && params.verificationId) ? true : false;
  },

type: 'SampleEnrollmentCheck'};
```
**'Enrollment Form Processor' script include category**

<table>
<thead>
<tr>
<th>Script include category</th>
<th>Description</th>
<th>Method signature</th>
<th>Input fields</th>
<th>Output fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrollment Form Processor</td>
<td>Checks whether all necessary information has been collected from the user. Stores the information so it can be used for verification when the user resets their password.</td>
<td>process(params)</td>
<td>Parameters:</td>
<td>Returns: (boolean) true, if the user is enrolled in the specified verification; otherwise, false.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• params.resetRequestId - The sys_id of the current Password Reset request (table: pwd_reset_request).</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• params.userId - The sys_id of the user to be verified (table: sys_user).</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• params.verificationId - The sys_id of the verification to be processed (table: pwd_verification).</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• request - The form request object. Fields in the form can be accessed with request.getParameter('&lt;element-id&gt;').</td>
<td></td>
</tr>
</tbody>
</table>

The following information should be added to the state of the enrollment process:

- `gs.getSession().putProperty("result.status",status)` - Whether the user was successfully enrolled.
- `gs.getSession().putProperty("result.message",message)` - An associated message to be returned to the UI, such as a detailed error message.
- `gs.getSession().putProperty("result.value",value)` - A custom value associated with the enrollment.
This example processes an enrollment form submission successfully if the user-submitted response was success. The code would be contained in the Script field of an extension script named SampleEnrollmentProcessor:

```javascript
var SampleEnrollmentProcessor = Class.create();
SampleEnrollmentProcessor.prototype = {
    category: 'password_reset.extension.enrollment_form_processor', // DO NOT REMOVE THIS LINE!

    processForm: function (params, request) {
        var verificationId = params.verificationId;
        var sampleInput = request.getParameter('sample_input');

        if (gs.nil(verificationId) || (sampleInput != 'success')) { return false; }

        var gr = new GlideRecord('sys_user');
        gr.get(params.userId);
        gs.print('User: ' + gr.getValue('user_name') + ' successfully enrolled');
        return true;
    }
};
```

The following information should be added to the state of the enrollment process:
- `gs.getSession().putProperty("result.status",status)` - whether the user was successfully enrolled
- `gs.getSession().putProperty("result.message",message)` - an associated message to be returned to the UI. Eg. a detailed error message
- `gs.getSession().putProperty("result.value",value)` - custom value associated with the enrollment
'Identification Form Processor' script include category

<table>
<thead>
<tr>
<th>Script include category</th>
<th>Description</th>
<th>Method signature</th>
<th>Input fields</th>
<th>Output fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification Form Processor</td>
<td>Processes an identification form request.</td>
<td>processForm(params, request)</td>
<td>params: processId - The sys_id of the calling Password Reset process (table: pwd_process). request - The form request object. Fields in the form can be accessed with request.getParameter('element-id'). Use request.getParameter('sysparm_user_id') to get the user ID that was entered into the form.</td>
<td>Returns: the sys_id of the user that corresponds to the requested input. Returns null, if no user was found.</td>
</tr>
</tbody>
</table>

This example attempts to identify the user within the sys_user table given a user name submitted from the identification form. The code would be contained in the Script field of an extension script named PwdIdentifyViaUsername:

```javascript
var PwdIdentifyViaUsername = Class. create();
PwdIdentifyViaUsername.prototype = {
  category: 'password_reset.extension.identification_form_processor', // DO NOT REMOVE THIS LINE!
  initialize: function() {},

  processForm: function(params, request) {
    var processId = params.processId; // The sys_id of the calling Password Reset process (table: pwd_process)
    var request = request; // The form request object. Fields in the form can be accessed with request.getParameter('element-id')
    var sysparm_user_id = request.getParameter('sysparm_user_id'); // The user identifier value entered in the form
    gr = new GlideRecord('sys_user'); // The sys_id of the user that corresponds to the requested input; if no user was found, null should be returned
    gr.addQuery('user_name', sysparm_user_id);
  }
};
```

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gr. query ( ) ; if ( !gr. next ( ) ) { return null ; } return gr. sys_id ; }

    
    type : 'PwdIdentifyViaUsername' }

'Password Generator' script include category

<table>
<thead>
<tr>
<th>Script include category</th>
<th>Description</th>
<th>Method signature</th>
<th>Input fields</th>
<th>Output fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>Password Generator</td>
<td>Returns an auto-generated password.</td>
<td>process(params)</td>
<td>Parameters:</td>
<td>Returns: (String) an auto-generated password.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• params.processId - The sys_id of the calling Password Reset process (table: pwd_process).</td>
<td></td>
</tr>
</tbody>
</table>

This example randomly generates a password from a base word and numbers. The base word is selected depending on the credential store. The code would be contained in the Script field of an extension script named SamplePasswordGenerator:

var SamplePasswordGenerator = Class. create ( ) ;
SamplePasswordGenerator. prototype = {
    category : 'password_reset.extension.password_generator' , // DO NOT REMOVE THIS LINE!

    /**********
    * Returns an auto-generated string password.
    * This sample randomly generates 4 digits to add to the password.
    *
    * @param params.credentialStoreId The sys_id of the target Password Reset credential store to generate
    * a password for (table: pwd_cred_store)
    * @return An auto-generated string password
    **********/
    process : function (params) { var basePassword ;

    var gr = new GlideRecord ( 'pwd_cred_store' ) ;
gr. addQuery ( 'name' , 'Local ServiceNow Instance' ) ;
gr. query ( ) ; if (gr. next ( ) ) { if (params. credentialStoreId == gr. getValue ( 'sys_id' ) )
    basePassword = "Password" ; else
    basePassword = "Dorwssap" ; } return this. generateSimple (basePassword ) ; } ,

    generateSimple : function (base) { var pwd = base ; var numbers = '0123456789' ; var length = 4 ;

    for ( var i = 0 , n = numbers. length ; i < length ; i ++ ) {
        pwd += numbers. charAt (Math. floor (Math. random ( ) * n ) + 1 ) ;
    }
return pwd ; } ,

    type : 'SamplePasswordGenerator' } ;
'Post Reset' script include category

<table>
<thead>
<tr>
<th>Script include category</th>
<th>Description</th>
<th>Method signature</th>
<th>Input fields</th>
<th>Output fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Reset</td>
<td>Performs additional operations after the completion of the Password Reset process.</td>
<td>process(params)</td>
<td>Parameters:</td>
<td>Returns: void</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• params.resetRequestId</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- The sys_id of the calling Password Reset process (table: pwd_process).</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• params.wfSuccess</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- A flag indicating whether the workflow completed successfully. True if, and only if, successful.</td>
<td></td>
</tr>
</tbody>
</table>

This example adds failed reset requests to the system log. The code would be contained in the Script field for an extension script named PwdPostProcessor:

```javascript
var PwdPostProcessor = Class.create();

PwdPostProcessor.prototype = {
    category : 'password_reset.extension.post_reset_script', // DO NOT REMOVE THIS LINE!

    initialize : function () {},

    //**********
    // Execute custom actions after the Password Reset process has completed.
    // @param params.resetRequestId The sys_id of the current Password Reset request (table: pwd_reset_request)
    // @param params.wfSuccess A flag indicating if the workflow completed successfully.
    // True if (and only if) successful.
    // @return no return value
    //**********/
    process : function (params) {
        if (!params.wfSuccess) {
            gs.log('[PwdPostProcessor.process] failure post processing for request [' + params.resetRequestId + ']');
        }

        // We could place actions here that we always want executed
        return;
    },

    type : 'PwdPostProcessor'
};
```

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'User Account Lookup' script include category

<table>
<thead>
<tr>
<th>Script include category</th>
<th>Description</th>
<th>Method signature</th>
<th>Input fields</th>
<th>Output fields</th>
</tr>
</thead>
</table>
| User Account Lookup    | Gets the credential store account ID for a given user. | process(params) | Parameters:  
  - params.userId - The sys_id of the user being checked (table: sys_user). | Returns: (String) the credential store account ID for the given user. |

This example gets the credential store account for a user. This code would be contained in the Script field of an extension script named SampleUserAccountLookupExtension:

```javascript
var SampleUserAccountLookupExtension = Class.create();
SampleUserAccountLookupExtension.prototype = {
  category: 'password_reset.extension.user_account_lookup', // DO NOT REMOVE THIS LINE!

  process: function (params) {
    return params.userId;
  },

  type: 'SampleUserAccountLookupExtension'
};
```

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### 'Verification Form Processor' script include category

<table>
<thead>
<tr>
<th>Script include category</th>
<th>Description</th>
<th>Method signature</th>
<th>Input fields</th>
<th>Output fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verification Form Processor</td>
<td>Processes a verification form request and indicates whether the user was verified or not.</td>
<td>processForm(params, request)</td>
<td>Parameters:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• params.resetRequestId - The sys_id of the current Password Reset request (table: pwd_reset_request).</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• params.userId - The sys_id of the user to be verified (table: sys_user).</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• params.verificationId - The sys_id of the verification to be processed (table: pwd_verification).</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• request - The form request object. Fields in the form can be accessed with request.getParameter('&lt;element-id&gt;').</td>
<td>Returns: (boolean) true, if the user is verified; otherwise, false.</td>
</tr>
</tbody>
</table>

This example shows a verification processor that returns true only if the user sent ok in the input field; otherwise, it returns false. The code would be contained in the Script field of an extension script named SampleVerificationFormProcessor:

```javascript
var SampleVerificationFormProcessor = Class.create();
SampleVerificationFormProcessor.prototype = {
    category: 'password_reset.extension.verification_form_processor', // DO NOT REMOVE THIS LINE!

    processForm: function(params, request)
    {
        // This is a sample verification processor returns true only if the user sent "ok" in the input field;
        // otherwise, it returns false.

        // @param params.resetRequestId The sys_id of the current Password Reset request (table: pwd_reset_request)
        // @param params.userId The sys_id of the user trying to be verified (table: sys_user)
        // @param params.verificationId The sys_id of the verification to be processed (table: pwd_verification)
    }
};
```
* @param request               The form request object. Fields in the form
can be accessed with
  * request.getParameter('<element-id>')
* @return Boolean indicating whether the user is successfully verified
**********/
processForm : function (params , request ) { if (request. getParameter
  ('sysparm_simple_input' ) == "ok" ) return true ; else return false ; } ,
type : 'SampleVerificationFormProcessor' } ;

Create a Password Reset extension script

Create extension scripts only from the Password Reset Extension Script form. Do not create extension
scripts in the System Definition Script Includes interface.

Role required: password_reset_admin or admin

__________________________
Note: To use a script include as an extension script, you must set it to Active status.
__________________________

1. Navigate to Password Reset Extensions New extension script.
2. Enter a name in the Extension script name field.
   Use CamelCase to construct a name without spaces, for example, PwdEnrollmentCustom.
3. Select an Extension script category.
   • Enrollment check
   • Enrollment form processor
   • Identification form processor
   • Password generator
   • User account lookup
   • Verification form processor
4. Click Submit.
   A new instance of the script include for the selected category opens.
5. Edit the script by providing an implementation in the body of the process or processForm function,
   depending on the script category. You can add additional functions as long as the process or
   processForm function accepts the defined parameters and returns the expected results.

__________________________
Note: Do not edit or delete the Category declaration.
__________________________
6. Click Update.

Service desk: Reset a password or unlock a user account

In a service desk-assisted Password Reset process, service desk agents with the password_reset_service_desk role reset user passwords—users cannot reset passwords. Watch a video example of service desk agents resetting passwords: Resetting User Passwords (Video).

Role required: password_reset_admin or password_reset_service_desk

**Note:**

- You must set the Public access property to enable the service desk-assisted process. See Configure your Password Reset process on page 2136.
- You can perform this activity on a mobile device.

1. Navigate to Password Reset Service Desk.
2. Select a user and the Password Reset process to use.
3. Click Verify Identity.
4. On the Verify Identity form, enter the answers that the user provides and then click Continue.
   If the user identity is verified, the Reset Password form displays identity verification and status of the account lock.
5. Perform one of the following actions.
• If the user is not locked, the form displays the Reset password button. Enter the new password and click Reset password.
• If the user is locked, the form displays the Reset password and Unlock account buttons. You can enter a new password and click Reset password to reset the password and unlock the account. If the Enable account unlock check box is selected for the password process, you can unlock the account without resetting the password by clicking Unlock account.

6. To reset the password for a different user, you must first navigate out of the Service Desk and then navigate to Password Reset Service Desk.

View user requests for password reset

The Reset Requests module displays the status of each password reset request from the Password Reset Request table [pwd_reset_request].

Role required: password_reset_admin or password_reset_service_desk

Navigate to Password Reset Reset Requests.

Table 1009: Password Reset request fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User</td>
<td>User whose password is being reset or changed.</td>
</tr>
<tr>
<td>Process</td>
<td>Process that implements this password reset request.</td>
</tr>
<tr>
<td>Type</td>
<td>Type of Password Reset request:</td>
</tr>
<tr>
<td></td>
<td>• Change Password: Request to change a password.</td>
</tr>
<tr>
<td></td>
<td>• Help Desk: Request opened on behalf of the requesting user by a service desk</td>
</tr>
<tr>
<td></td>
<td>agent.</td>
</tr>
<tr>
<td></td>
<td>• Self Service: Requesting user opened the reset request.</td>
</tr>
<tr>
<td>Action Type</td>
<td>Corrective action performed during the Password Reset request:</td>
</tr>
<tr>
<td></td>
<td>• Change Password: Update the credential store with the new password.</td>
</tr>
<tr>
<td></td>
<td>• Reset and Unlock Account: Generate a new password for the user and unlock</td>
</tr>
<tr>
<td></td>
<td>the user account.</td>
</tr>
<tr>
<td></td>
<td>• Reset Password: Generate a new password for the user.</td>
</tr>
<tr>
<td></td>
<td>• Unlock Account: Unlock the user account.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Status</td>
<td>Result of the Password Reset request:</td>
</tr>
<tr>
<td></td>
<td>• Completed With Failure: User completed all steps in the Password Reset process, but the password was not reset in the credential store.</td>
</tr>
<tr>
<td></td>
<td>• Completed With Success: User completed all steps in the Password Reset process and the password was reset in the credential store.</td>
</tr>
<tr>
<td></td>
<td>• Expired: User did not complete all steps in the Password Reset process in the time allowed.</td>
</tr>
<tr>
<td></td>
<td>• In Progress: User is working through the steps to reset the password.</td>
</tr>
<tr>
<td></td>
<td>• Max Number of Attempts: User failed to answer the security questions correctly during the identity verification step and has exceeded the maximum number of attempts allowed.</td>
</tr>
<tr>
<td></td>
<td>• Verified: User has completed the identity verification step and is verified. The user can move to the Password Reset step.</td>
</tr>
<tr>
<td>Active</td>
<td>Whether the request is open or closed.</td>
</tr>
<tr>
<td>Retry</td>
<td>Total number of times the user has attempted to complete a password reset request.</td>
</tr>
</tbody>
</table>

### Unblock a Password Reset user

If a user is manually banned or is flagged as exceeding max attempts, the user can be blocked (not allowed to use the Password Reset application). You can unblock a blocked user.

**Role required:** password_reset_admin or password_reset_service_desk

**Blocking events include:**

- The user exceeded the limit for the number of failed password attempts.
- The most recent password reset occurred before the wait time required until the next reset.
- The user failed to provide the correct information while attempting to reset the password.

If the number of blocked or locked users exceeds the limit within a defined time interval, it triggers a system log event. You can configure the number of blocked or locked users and the time interval required to generate the log event by setting the password_reset.activity_monitor.incident_threshold and password_reset.activity_monitor.incident_window properties.

1. To view the list of blocked users, navigate to Password Reset Blocked Users.
2. To unblock a self-service user:
   a) Navigate to Password Reset Blocked Users.
   b) Select a user from the list.
c) Select Delete on the Actions on selected rows list.

3. To unblock a user whose password was reset by a service desk agent:
   If a user is manually banned or flagged as exceeding max attempts, the user can be blocked (not allowed to use the Password Reset application). When the password reset request is made through self-service, the user is unblocked when the password is successfully reset.

   In contrast, service desk agents are allowed any number of retries. The max_attempt_reached limit does not apply and the Blocked status for the user is not reset after the password is reset. As a result, after you successfully reset a user password, you must unblock the user manually.

   If the user is not unblocked manually, then the system resets the blocked state only when the max_attempt_window time period elapses and the user tries to reset the password using self-service.

   a) After you successfully reset a user password, navigate to Password Reset Blocked Users .
   b) Change the Blocked setting for the user from true to false.

Integrate Password Reset with a Service Portal widget

You can enable a Password Reset process in a Service Portal page by adding a widget that opens the password reset pages inside the portal.

Role required: admin or sp_admin

1. On the Service Portal Designer for the portal, create a new page — the page where the user will perform the password reset process.

2. On the Widget tab, under Layouts, select the 12-column layout and drop it onto the page.

3. Drop the Pwd reset widget into the 12-column layout and then save the page.
   The three tabs of the password reset process appear in the layout.

4. In the "Reset my password" link on the login page for the portal, specify the URL of the new password reset page. The URL must include one required parameter and may contain one optional parameter:
   • Required: sysparm_show_custom_header_footer=false. This parameter disables the native header and footer feature of the password reset page.
   • Optional: sysparm_redirect_url=<portalName>?id=<pageName>. This parameter specifies the page to go to after a successful reset — typically the login page for the portal.

   For example, https://server.acme.com/acme_community?id=password_reset_page&sysparm_show_custom_header_footer=false&sysparm_redirect_url=acme_community?id=communities_login

Integrate Password Reset with a CMS integration

You can configure a site in the ServiceNow content management (CMS) application to define a single-site access point that includes the Password Reset service. For example, you can create an employee self-service site that provides Password Reset service.

Role required: content_admin

Each Password Reset process requires a separate CMS page.

1. Navigate to Content Management Specialty Content iFrames and create an iFrame record.

2. Go to Content Management Sites and create a site that has no login page.
3. Go to Content Management Pages and create a password reset page.
4. Enter the name of the site that you created in the Content site field (Password Reset self-service in the example).
5. Right-click the form header and click Save.
6. Click the Edit Page related link and then click Add content.
7. In the Content Blocks section, select the iFrame that you created. Add more content as needed.
8. Click Update.

Password Reset and Password Change reports and logs

The Password Reset application provides several tools for monitoring and troubleshooting password reset activities.

Users with the password_reset_credential_manager or password_reset_admin role can view the status of password reset activities, identify potential security threats, and monitor for compliance with password security policies.
The Reset Requests, Activity Log, and Blocked Users modules are useful for monitoring password reset activities and for troubleshooting password reset issues. They also provide access to more detailed information than is provided on the Overview module.

To make room for new data, the system periodically purges the data that is used for password reset monitoring and reporting.

**Password Reset Overview module**

The Password Reset Overview module displays reports on password reset and password change activities. Users with the `password_reset_admin` role can customize the layout of the reports that appear in the Overview module.

<table>
<thead>
<tr>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Password Requests (last 7 days)</td>
<td>Number of password reset requests by type during the last 7 days.</td>
</tr>
<tr>
<td>Blocked Users (last 7 days)</td>
<td>Number of users blocked over the last 7 days.</td>
</tr>
<tr>
<td>Password Reset Request Status (last 7 days)</td>
<td>Status of all password reset requests by process.</td>
</tr>
<tr>
<td>Password Reset Request by Action (last 30 days)</td>
<td>Number of password reset requests by action type: Reset Password, Unlock Account, or Reset and Unlock.</td>
</tr>
<tr>
<td>Password Reset Top Users (last 30 days)</td>
<td>Number of password reset requests per user. Many password reset requests from a single user could indicate a security issue.</td>
</tr>
<tr>
<td>Password Reset Failed Verifications (last 7 days)</td>
<td>Number of failed verification attempts, by verification instance. A failed verification occurs when a user attempts to reset the password, but fails for one reason or another, during the identity verification step. Many failed verification attempts for a specific type of verification could indicate that the process is too complicated or unclear.</td>
</tr>
<tr>
<td>Password Reset Enrollment By Verification</td>
<td>Number of users by verification type who enrolled and did not enroll in the password reset program. A large number for users who did not enrolled could indicate a compliance or communication issue within the organization.</td>
</tr>
<tr>
<td>Password Change Top Users (last 30 days)</td>
<td>Number of password change requests per user. Many password change requests from a single user could indicate a security issue.</td>
</tr>
</tbody>
</table>
Password Reset activity log

The activity log (Password Reset Activity Log) provides detailed information that you can use to troubleshoot and to generate reports on password reset metrics. Information contained in the activity log is stored in the Password Reset activity log [pwd_reset_activity] table.

You must have the password_reset_credential_manager or password_reset_admin role to view the log.

Password Reset event log

The event log is a valuable resource for troubleshooting. On the Start menu, click Programs (or All Programs) Administrative Tools Event Viewer.

If the log does not appear, then, on the Windows Logs menu, click Applications Service Logs.

You must have the admin role to view the log.

To write to the Password Reset event log

Edit the DebugFlag registry key entry at: Computer > HKEY_LOCAL_MACHINE > SOFTWARE > Microsoft > Windows > CurrentVersion > Authentication > Credential Providers > {B6EFF27D-C1C4-481F-B81B-F3547C47D58A}

By default, the key is set to 0. Set the key to 1 to write log entries to the ServiceNowPwdReset event log.

You must have the password_reset_credential_manager or password_reset_admin role to write to the log.

Password Reset blocked user notification

You can receive email notifications when the number of users that are blocked or locked exceeds the password blocked threshold. Notifications can alert you to suspicious activities. The default threshold is 10.

To subscribe: Add an email notification device or modify an existing device and then subscribe to the Password Reset-Activity Monitor Lockout notification.

You must have the password_reset_credential_manager or password_reset_admin role to subscribe.

Schedule for purging Password Reset data

To make room for new data, the system periodically purges the data that is used for password reset monitoring and reporting. Information contained in reports and monitoring tools could change dramatically immediately after a data purge. Contact ServiceNow Technical Support to modify purge intervals.
Table 1011: Purge intervals for Password Reset tables

<table>
<thead>
<tr>
<th>Table name</th>
<th>Purge interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>[pwd_reset_request]</td>
<td>90 days (7,776,000 seconds).</td>
</tr>
<tr>
<td></td>
<td>Depending on your organizational data</td>
</tr>
<tr>
<td></td>
<td>monitoring requirements, you could configure</td>
</tr>
<tr>
<td></td>
<td>the rule to:</td>
</tr>
<tr>
<td></td>
<td>• Purge successful requests after 90 days</td>
</tr>
<tr>
<td></td>
<td>• Keep failed requests for 120 days</td>
</tr>
<tr>
<td>[pwd_user_lockout]</td>
<td>90 days (7,776,000 seconds).</td>
</tr>
<tr>
<td></td>
<td>Depending on your organizational data</td>
</tr>
<tr>
<td></td>
<td>monitoring requirements, you could configure</td>
</tr>
<tr>
<td></td>
<td>the rule to:</td>
</tr>
<tr>
<td></td>
<td>• Purge successful requests after 90 days</td>
</tr>
<tr>
<td></td>
<td>• Keep failed requests for 120 days</td>
</tr>
<tr>
<td>[pwd_reset_activity]</td>
<td>90 days (7,776,000 seconds).</td>
</tr>
<tr>
<td>[pwd_activity_monitor]</td>
<td>90 days (7,776,000 seconds).</td>
</tr>
<tr>
<td>[pwd_dvc_enrollment_code]</td>
<td>1 day (86,400 seconds).</td>
</tr>
<tr>
<td>[pwd_sms_code]</td>
<td>1 day (86,400 seconds).</td>
</tr>
</tbody>
</table>

User guide: Resetting your password

Your experience might differ, but the self-service process is a typical process that you might follow to reset your password.

Example experience of the self-service process

Your experience might differ, but here:

1. On the login page, you click the Forgot Password? link to start the process.
2. The Identify page opens and you enter your identifying information (typically username or email address). The example includes the default Google reCAPTCHA security feature:

![ServiceNow Identify Page](image)

3. On the Verify page, you verify your identity by providing information that proves that you are who you say you are. The admin configured the method of verification and can require multiple verifications. In the example, the admin has configured the Security Question verification. You must answer a question to prove your identity. (Earlier, while enrolling for the password reset process, you selected...
the question and provided a secure private answer.) Other possible verifications require you to enter a code number that was sent to a mobile device by SMS text, through the Google Authenticator app, or by email.

4. The system checks the credential store to verify your identity and then displays, on the Reset page, the new password.
Enroll in the Password Reset program

Some organizations auto-enroll users in a Password Reset program. Your organization could offer end users the option to enroll for one or more methods of verifying identity when resetting the password. End users can enroll for most Password Reset programs on a mobile device.

End users might enroll for any combination of the following methods:

**Verify your identity using security questions (QA verification)**

- To enroll, you choose multiple questions that only you can answer (like the name of your first pet) and then supply answers. The system stores your answers securely.
- Later, when you want to reset your password, the system presents one or more of the questions. You answer the questions to verify your identity. See
Verify your identity using an SMS code (SMS verification)

- To enroll, you authorize a device like a cellular phone for SMS verification.
- Later, when you want to reset your password, you get a code number on the device and enter the code on the web page to verify your identity.

Verify your identity using an Emailed code

- To enroll, you authorize one or more email addresses.
- Later, when you want to reset your password, the system sends a code number to the email address. You then enter the code on the web page to verify your identity.

Verify your identity using the Google Authenticator app

- You enroll on a computer that you normally use to access the instance (you use Google Authenticator to reset your password, but cannot use Google Authenticator to enroll for Password Reset Windows Application.). After you have enrolled, you load the Google Authenticator app on one or more devices and then authorize the devices for Google Authenticator verification.
- Later, when you want to reset your password, read the Google Authenticator code on your device and then enter the code on the web page to verify your identity.

Users: Enroll in the Password Reset program using questions and answers

Your organization might ask you to select the questions to use when resetting your password. You select the questions and provide answers that only you know. At another time, when you reset your password, your answers verify your identity. You can enroll on a mobile device.

Role required: none

The list of questions is presented in the language that you requested while logging in.

1. Navigate to Password Reset Enroll and then click the QA Verification tab.
   If you are required to enroll for the QA verification method, then the tab is marked with an asterisk (*).
2. For each Question field, select a question from the list and then enter the answer in the Answer field.
   Repeat the process until the required number of Question and Answer fields are filled in.
3. Click Submit.
4. Enroll for an extra identity verification using any of the other methods that your organization offers.
   See:
   - Users: Enroll in the Password Reset program using SMS codes on page 2220
   - Users: Enroll in the Password Reset program using Google Authenticator on page 2221
   - Users: Enroll in the Password Reset program using emailed codes on page 2220
Users: Enroll in the Password Reset program using SMS codes

To prove that you are who you say you are (verify your identity) while resetting your password, you can use a code number (the SMS code) that was delivered to your mobile phone or device. You can enroll on a mobile device.

Role required: none

1. Navigate to Password Reset Enroll and then click the SMS Verification tab.
   If your organization requires you to enroll for the SMS verification method, then the tab is marked with an asterisk (*).

2. If you had previously added an SMS-enabled device to your Password Reset profile, the device is listed. To add and verify a device, click Add Device and then follow the instructions. Provide a meaningful Name for each device. Repeat the process for as many devices as you need.

3. After you verify each device, select the Authorized check box for each device that you expect to use to change or reset your password.

   **Note:** You can deauthorize a device at any time by clearing the Authorized check box.

4. Click Submit.

5. Enroll for an additional identity verification using any of the other methods that your organization offers. See:
   - Users: Enroll in the Password Reset program using questions and answers on page 2219
   - Users: Enroll in the Password Reset program using Google Authenticator on page 2221
   - Users: Enroll in the Password Reset program using emailed codes on page 2220

Users: Enroll in the Password Reset program using emailed codes

To prove that you are who you say you are (verify your identity) while resetting your password, you enter a code that was sent to your email address. You can enroll for this program on a mobile device.

Role required: none

During this enrollment process, you add the email address, the system sends you a code so you can verify the address, and then you authorize the address to be used for the Password Reset process. By default, the system sends the code to the email address that is associated with your ServiceNow profile. You can send the code to additional email addresses.

1. Navigate to Password Reset Enroll and then click the Email Verification tab.
   If your organization requires you to enroll for the Email verification method, then the tab is marked with an asterisk (*). Email addresses that were added previously are listed on the tab.

2. Click Add Email, enter the Email address and a meaningful Email name to associate with the address and then click Add Email. Repeat the process for as many email addresses as you need.

3. On the Email Verification tab, for each email that should receive Password Reset codes, click Verify. The system sends an email message with a code and then displays the Verify the Email Address pop-up.

4. On the Verify the Email Address pop-up, enter the code and click Verify. If this process fails, click Send a New Code to send a different code and try again.

5. After you verify each email address, select the Authorized check box for each address that you expect to use to change or reset your password.

   **Note:** To deauthorize an email address so that it does not receive Password Reset codes, clear the Authorized check box.
6. Click Submit.
7. Enroll for an additional identity verification using any of the other methods that your organization offers. See:
   • Users: Enroll in the Password Reset program using questions and answers on page 2219
   • Users: Enroll in the Password Reset program using SMS codes on page 2220
   • Users: Enroll in the Password Reset program using Google Authenticator on page 2221

Users: Enroll in the Password Reset program using Google Authenticator

To prove that you are who you say you are (verify your identity) while resetting your password, you get a code number from Google Authenticator on your cell phone or mobile device and then enter the code on the Password Reset web page. If you already paired a device (for example, to log in to the ServiceNow instance), you can skip this enrollment process.

Role required: none

You cannot enroll for the Password Reset program on a mobile device.

1. Navigate to Password Reset Enroll and then click the Google Authenticator Verification tab.

   **Note:** If your organization requires you to enroll for the Google Authenticator verification method, then the tab is marked with an asterisk (*).

2. Download the Google Authenticator app to your device.
3. Open the app and then use the device to scan the QR code on the tab.
4. When the device generates a code, enter the code in the text box and then click Pair Device.
5. Click Submit.
6. If the system displays a success message, click Submit. If the system displays a failure message, enter the code again, click Pair Device, and then click Submit.

   When you submit the enrollment, the tab displays the following options:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generate New QR Code</td>
<td>Enables you to pair a device with a new code. This option is useful if you have a new device. Existing multi-factor authentication data is replaced with the new data.</td>
</tr>
<tr>
<td>Disable Multi-factor Authentication</td>
<td>Deletes existing multi-factor authentication data. The Google Authenticator verification is no longer available.</td>
</tr>
</tbody>
</table>

7. Enroll for an additional identity verification using any of the other methods that your organization offers. See:
   • Users: Enroll in the Password Reset program using questions and answers on page 2219
   • Users: Enroll in the Password Reset program using SMS codes on page 2220
   • Users: Enroll in the Password Reset program using emailed codes on page 2220

Users: Reset your password on Windows systems

If your organization uses the Password Reset Windows Application, you can reset your password directly from your Windows login screen.
Role required: none

1. Start your computer or press Ctrl+Alt+Delete to go to the Windows login screen.
2. Click the Forgot Password? link. (Your administrator may configure different text for the link.)
3. On the Identify page, enter the requested information and then click Next.
4. On the Verify page, enter the requested information, and then click Next.

**Note:** You might be given the option to choose the method used to verify your identity.

If your identity is verified, the Reset page displays whether you were successfully verified and the state of your account (either locked or unlocked).

5. Based on your locked/unlocked state, perform one of the following actions:
   - If your account is not locked, the page displays the Reset Password button. Enter and reenter the new password and then click Reset Password.
   - If your account is locked, the page displays the Reset Password and Unlock Account buttons.
     - You can enter a new password and click Reset password to reset the password and unlock the account.
     - If your administrator has selected Enable account unlock for the password process, you can unlock the account without resetting the password by clicking Unlock account.

**Response templates**

Response templates (formerly known as templated snippets) are reusable messages that can be copied to any case form that meets the specified conditions. You can use response templates to provide quick and consistent messages to users, allowing agents to resolve cases faster and more efficiently.

**Assign response template roles**

The roles of response template administrator, writer, and reader are installed when you activate the response templates plugin. Before you begin using response templates, you must assign these roles to the appropriate roles, groups, or users in your application.

- *Assign response template roles* on page 2226
For example, in the HR Service Delivery application, users with the HR administrator role are assigned the response template administrator role, users with the HR manager role are assigned the response template writer role, and users with the HR case writer role are assigned the response template reader role.

**How to use response templates**

Response template writers can create response templates. Each template is associated with a table that is an extension of the Task [task] table. The template can be configured to include variables pulled from that table. You can also specify the conditions that a case must meet for the template to be available for use.

- *Create or modify a response template* on page 2226

Response template readers can then copy response template content to any field on a form that meets the specified conditions.

For example, in the HR Service Delivery application, HR case writers with the response template reader role can copy response template content to any field on an HR case form that meets the specified conditions. See *Copy a response template to an HR case* for an HR-specific example.

**Escalating payroll discrepancy cases**

An enterprise HR organization using the HR Service Delivery application wants to create a template to use when responding to payroll discrepancy cases that need to be escalated.

A user with the response template writer role, such as an HR manager, can create the template to escalate payroll discrepancy cases. The template can be associated with the HR Payroll Case [sn_hr_core_case_payroll] table, and a condition can be set to filter on cases that match the appropriate HR service called Payroll Discrepancy. In the template body, the text to be used can be provided and variables added, such as the subject person name in the salutation.

After the template is created, users with the response template reader role, such as HR case writers, can copy the template content and use it in their responses to employees when working on payroll discrepancy cases.

**Activation information**

To use response templates in your application, you must *activate response templates*. For information on what components are installed with the feature, see *Components installed with response templates* on page 2225.

**Activate response templates**

You can activate response templates (formerly known as templated snippets) [com.sn_templated_snip] if you have the admin role. This plugin includes demo data and activates related plugins if they are not already active.

Role required: admin

Response templates activate these related plugins if they are not already active.
Table 1012: Plugins for response templates

<table>
<thead>
<tr>
<th>Plugin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scoped Application Restricted Caller Access</td>
<td>Allows scoped applications to restrict access to public tables and script includes.</td>
</tr>
</tbody>
</table>

1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.
   - If the plugin depends on other plugins, these plugins are listed along with their activation status.
   - If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).
4. If available, select the Load demo data check box.
   - Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.
   - You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.
5. Click Activate.

Components installed with response templates

Several types of components are installed with activation of the response templates (formerly known as templated snippets) plugin, including tables and user roles.

Note: To view all other components installed with this plugin, see the Application Files table. For instructions, see Find components installed with an application.

Demo data is available for this feature.

Roles installed

<table>
<thead>
<tr>
<th>Role title [name]</th>
<th>Description</th>
<th>Contains roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Templated snippets administrator</td>
<td>Grants access to scoped administration of the templated snippets feature.</td>
<td>• sn_templated_snip.template_snip_writer[sn_templated_snip.template_snippet_admin]</td>
</tr>
<tr>
<td>Templated snippets writer</td>
<td>Grants access to create, read, update, and delete (CRUD) templated snippet content.</td>
<td>• sn_templated_snip.template_snip_writer[sn_templated_snip.template_snippet_writer]</td>
</tr>
<tr>
<td>Templated snippets reader</td>
<td>Grants access to read templated snippet content.</td>
<td>• None</td>
</tr>
</tbody>
</table>
### Tables installed

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note Template</td>
<td>Table for templated snippets.</td>
</tr>
<tr>
<td>[sn_templated_snip_note_template]</td>
<td></td>
</tr>
</tbody>
</table>

### Assign response template roles

You must assign the roles of response template (formerly known as templated snippet) administrator, writer, and reader to the appropriate roles, groups, or users in your application.

**Role required:** sn_templated_snip.template_snippet_admin

The following roles are installed when you activate the response templates plugin. See *Components installed with response templates* on page 2225 for more information.

- Response template administrator [sn_templated_snip.template_snippet_admin]
- Response template writer [sn_templated_snip.template_snippet_writer]
- Response template reader [sn_templated_snip.template_snippet_reader]

You must assign these roles to the appropriate roles, groups, or users in your application. For example, in the HR Service Delivery application, users with the HR administrator role are assigned the response template administrator role, users with the HR manager role are assigned the response template writer role, and users with the HR case writer role are assigned the response template reader role.

- To assign a response template role to another role.
  See *Add a role to an existing role.*
- To assign a response template role to a group.
  See *Assign a role to a group.*
- To assign a response template role to a user.
  See *Assign a role to a user.*

### Create or modify a response template

As a response template writer, you can create or modify a response template (formerly known as a templated snippet). Each template is associated with a table that is an extension of the Task [task] table, and the template can be configured to include variables pulled from the table. You can also specify the conditions that a case must meet for the template to be available for use.

**Role required:** sn_templated_snip.template_snippet_writer

1. Navigate to System Definition Response template configuration.
2. Click New or open a record.
3. Fill in the fields on the form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the response template.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Table</td>
<td>Name of the table that the response template is associated with.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> The table must be an extension of the Task [task] table.</td>
</tr>
<tr>
<td>Condition</td>
<td>Conditions under which the response template is made available for use.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> The conditions available to use are dependent on the table you select.</td>
</tr>
<tr>
<td>Template body</td>
<td>Text of the response template.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Rich text is not supported with response templates.</td>
</tr>
<tr>
<td>Select variables</td>
<td>Variables that can be added to the template body.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> The variables available to use are dependent on the table you select.</td>
</tr>
</tbody>
</table>

The following GIF shows an example of an HR manager in the HR Service Delivery application creating a response template to escalate payroll discrepancy cases. The template is associated with the HR Payroll Case [sn_hr_core_case_payroll] table, and a condition is set to filter on cases that match the Payroll Discrepancy HR service. The template text is pasted into the body, and then a variable for the subject person is added to the salutation.
4. Click Submit or Update.

You can copy response template content to any field on a form that meets the specified conditions.

The following GIF shows an example of an HR case writer in the HR Service Delivery application opening a payroll discrepancy case and copying a payroll discrepancy escalation template to the comments field in the HR case form for the employee to read.
<table>
<thead>
<tr>
<th>Case Number</th>
<th>Status</th>
<th>Owner</th>
<th>Reason</th>
<th>Description</th>
<th>Tier</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRC001037</td>
<td>Ready</td>
<td>Eva Seehorn</td>
<td>Payroll Discrepancy</td>
<td>Payroll discrepancy</td>
<td>Tier 1</td>
</tr>
<tr>
<td>HRC001036</td>
<td>Ready</td>
<td>Gale Nolau</td>
<td>Employee Payroll Setup Request</td>
<td>Employee Payroll Setup Request</td>
<td>Tier 1</td>
</tr>
<tr>
<td>HRC001030</td>
<td>Work in Progress</td>
<td>Philippe Bertrand</td>
<td>Request Onboarding</td>
<td>Request Onboarding case for Philippe Bertrand</td>
<td>Onboarding</td>
</tr>
<tr>
<td>HRC001029</td>
<td>Ready</td>
<td>Gale Nolau</td>
<td>Employee Payroll Setup Request</td>
<td>Employee Payroll Setup Request</td>
<td>Tier 1</td>
</tr>
<tr>
<td>HRC001023</td>
<td>Work in Progress</td>
<td>Gale Nolau</td>
<td>Request Onboarding</td>
<td>Request Onboarding case for Susan Taylor</td>
<td>Onboarding</td>
</tr>
<tr>
<td>HRC001022</td>
<td>Ready</td>
<td>Gale Nolau</td>
<td>Employee Payroll Setup Request</td>
<td>Employee Payroll Setup Request</td>
<td>Tier 1</td>
</tr>
<tr>
<td>HRC001016</td>
<td>Work in Progress</td>
<td>Gale Nolau</td>
<td>Request Onboarding</td>
<td>Request Onboarding case for Willis Jones</td>
<td>Onboarding</td>
</tr>
<tr>
<td>HRC001015</td>
<td>Ready</td>
<td>Gale Nolau</td>
<td>Employee Payroll Setup Request</td>
<td>Employee Payroll Setup Request</td>
<td>Tier 1</td>
</tr>
<tr>
<td>HRC001014</td>
<td>Ready</td>
<td>Gale Nolau</td>
<td>Request Relocation Assistance</td>
<td>Request Relocation Assistance</td>
<td>Tier 1</td>
</tr>
<tr>
<td>HRC001013</td>
<td>Ready</td>
<td>Gale Nolau</td>
<td>Work Visa Transfer Request</td>
<td>Employee Work Visa Transfer Request</td>
<td>Tier 1</td>
</tr>
</tbody>
</table>
Self-service

The Self-Service application gives supported end users a clean, simple front end to their IT support organization.

By default, the Self-Service application provides access to common actions, such as viewing your homepage, accessing the Service Catalog, viewing knowledge articles, working with incidents, and taking surveys.

Service catalog requests

This page contains links to content on service catalog requests.

Add new request items

Use ServiceNow's web-based interface to add new items to a request.

Roles required: Only an administrator or a user with the catalog_admin role can add a new item to a submitted request.

Modifying a request does not resubmit it to the approval process.

1. Navigate to Service Catalog Open Records Requests and open an existing request.
2. Click Add New Item.
3. In the dialog box that appears, choose an item and a quantity to add.
4. Click OK.

Amazon EC2 instance request from the Service Catalog

Users can request the provisioning and deletion of virtual computers (Linux or Windows) in the Amazon EC2 virtual computing environment through the ServiceNow Service Catalog.

The Amazon EC2 offering requires the purchase and activation of ServiceNow Orchestration Automaton.

Request an instance

Request the provisioning of a new Amazon EC2 instance through the service catalog.

1. Navigate to Self-Service Service Catalog
2. Select Amazon EC2 Instance from the Request Application Infrastructure category.
Figure 413: EC2 Service Catalog 2

3. Select the operating system, the type of instance (Large or Small), and the number of instances requested.
   See the specifications for Large and Small instances in Amazon EC2 Instance Types.

4. Type a reason for the request.
5. Click Order Now to order the instance.

The Order Status form appears, summarizing the request. A status bar tracks the progress of the approval and provisioning of the EC2 instance.

Figure 414: EC2 Service Catalog
Terminate an instance

Shut down an Amazon EC2 instance through the service catalog.

1. Navigate to Service Catalog Routine Changes Terminate Amazon EC2 Instance.
   
   A list appears displaying the instances that are assigned to you.

2. Select an instance from the list and click Order.
   
   This list does not support multi-line selection, and there is no undo feature.

Check-out redirect property

A property called One-step checkout redirect (glide.vm.checkout_redirect) controls the view presented to virtual machine requesters in the service catalog.

By default, this property is set to false, which redirects the view to the Order Status form when the requester clicks Order Now. When this property is set to true, ServiceNow redirects the requester to his or her My Virtual Assets portal. This property is located in Cloud Management Administration Properties.

Delete request items

Use ServiceNow's web-based interface to delete items from a request.

All users can delete items from their own requests any time prior to delivery. Modifying a request does not resubmit it to the approval process.

1. Navigate to Service Catalog Open Records Requests and open an existing request.

2. In the Requested Items related list, select the check box beside the item to delete.
3. In the Actions choice list, select Delete.
   ServiceNow recalculates the price and delivery date for the order.

Place a request

Use ServiceNow's web-based interface for ordering predefined goods and services.

1. Navigate to Self-Service Service Catalog.
   The default catalog view organizes items in categories and subcategories.

```
[Image: Default catalog view]
```

2. Select an item to order.
   **Note:** Some items are order guides, which combine related items for easier ordering.
   For example, an order guide called New Employee Hire presents a list of items that new
   employees typically receive (desk, phone, computer, email account). After you select the items
   you want to order, the order guide requests the information required and shows a separate
   time to delivery for each item ordered.

   The order screen requests any additional information that's needed, such as the requester's name or
   location and the date the item is needed. It also displays the item's delivery time after approval.
3. Enter complete and accurate information to expedite your order.
4. Order any other items required.
5. Click Order Now when the order is complete.

ServiceNow displays a confirmation screen for your order:
You can view the order's progress in the Stage column.

**Note:** It may be useful to note the order number for future reference.

ServiceNow automatically notifies the approvers if approval is required and creates work orders to fulfill the order according to your organization's process. For example, if you order a new notebook computer, the purchasing group might receive a work order to order the computer, and the desktop services group might receive a work order to configure the new computer and deliver it to your office after it arrives.

**Create incidents and change requests from a requested item**

You can quickly open an incident or a change request from a requested item. It also maintains a relationship between the requested item, and its associated incidents or change requests.

The administrator must enable the Create Change and Create Incident UI actions for the Requested Item [sc_req_item] table. The administrator must set the Active field to true when editing these UI actions.
Role required: itil

1. Navigate to Self-Service Requested Items.
2. Open a requested item.
3. Click the Additional actions menu icon and select Create Change or Create Incident.

View request status

Use ServiceNow’s web-based interface to view the status of a request.

1. Navigate to Self-Service Requested Items.
2. Click your order number to view details.
3. View the order’s progress in the Stage field.

Customize homepages

If you are assigned at least one role in the system, you can create a customized homepage that you can see when you log in.

The content on your homepage comes from a variety of sources, such as graphs and charts generated from a report, application modules, a service catalog category, the scrolling news widget, which is the News knowledge category.

1. Navigate to Self-Service Homepage.
2. Add any item to the homepage by clicking the add content icon or the Add content link at the top.
   A window will open that lets you select from a number of different homepage items you can add. Some items pertain to specific features and applications, such as CMS content blocks and the Work Management dispatch map. So the list of items varies depending on what is active on your system.
3. Reposition elements on your homepage by dragging and dropping them to a new location.
4. To remove a homepage item, click the [X] on the right side of the item's header.

Delete custom homepages

You can delete any of your custom homepages if you no longer need them.

1. Click the Delete page link at the bottom of the homepage.
2. Click Ok to confirm the deletion.

How Help the Help Desk identifies devices

Help the Help Desk uses a predefined series of queries to identify and update existing CIs in the CMDB or to create a new CI if no match is found.

These queries attempt to match devices using the three criteria listed here, in this order. Updates to an existing CI require only a single match as the list is evaluated. For example, if a device's name has changed, but the MAC address is the same, the CI with the matching MAC address is updated.

- Serial number in the cmdb_ci_computer table#
- MAC address in the cmdb_ci_network_adapter table
- Computer name in the cmdb_ci_computer table

**Note:** Discovery Identifiers are incompatible with Help the Help Desk queries.

Script Include

The script include CIIdentifierForHelpDesk provides the logic for updating existing CIs or creating a new CI if no matching device exists in the CMDB. Do not modify this script. Errors introduced into this script can result in update failures or in new CIs being created for every device found.

Running Help the Help Desk

Help the Help Desk is a tool that enables users to populate the CMDB automatically with information about their Windows computer. Help the Help Desk is a small Web application that downloads and runs locally, using a login script to gather information such as serial number, computer name, disk configuration, network configuration, installed software, memory, and much more.
To detect all system software successfully on a 64-bit machine, make sure to run the Help the Help Desk script from a 64-bit browser. A 64-bit browser can detect both 64-bit and 32-bit software, but a 32-bit browser cannot detect 64-bit software.

1. On your instance, navigate to Self Service > Help the Help Desk.
2. Click Start the Scan to Help the Help Desk.
   You are prompted to run or save the discovery.hta script.
3. If your browser is Internet Explorer, run the script. If you are using any other browser, click Save and save the script to the local machine.
4. To execute the saved script, double click the file.
   The script runs a series of WMI queries to gather information about the Windows machine. When it is done, the data is sent back to your ServiceNow instance and used to populate the configuration database (CMDB).

Service Delegation

Service delegation is the ability to designate other users to view and interact with approvals and tasks assigned or sent to you, and to receive copies of all email notifications sent to you.

---

**Note:** Users to whom you delegate responsibility see all pending tasks and approvals regardless of the delegation period.

**Note:** Delegation does not cascade. When a user acts as a delegate for another user, the delegate cannot in turn delegate to a third party. The original delegate is the only user who receives assignments and notifications.

---

Add the Delegates related list to a user profile

To delegate approvals and tasks to another user, configure your user profile form to display the Delegates related list.

Role required: personalize_form or admin.

1. Navigate to Self-Service My Profile.
2. On the form context menu, navigate to Configure Related Lists, and then add the Delegate->User related list.

The Delegates related list displays at the bottom of the user profile form.

Delegate approvals and tasks to another user

If a user is out of the office, that user can delegate responsibilities to other users for a period of time.

1. Navigate to Self Service My Profile.
2. In the Delegates related list, click New.
Figure 420: Delegates Related List

If the list is not visible, configure the form to add the Delegate->User related list.

3. Select the Delegate (User).
4. Set the period of time.
5. Specify the responsibilities the delegate will assume using the following check boxes. You can delegate:
   - Approvals: The delegate can approve items on your behalf.
   - Assignments: The delegate can view and work on tasks assigned to you.
   - CC Notifications: The delegate receives a copy of Change Control email notifications sent to you, except those marked as Meeting Invitation.
**Note:** If the Approvals check box is selected but CC Notifications is not, the delegate does not receive change-related approvals.

- **Meeting Invitations:** The delegate receives a copy of email notifications sent of the type Meeting Invitation.

**Note:** You must select an active user as your delegate. The instance only delegates to active users.

A sample delegation looks like this:

![Delegation Options](image)

**Figure 421: Delegation Options**

**Note:** If your delegate gets email notifications, they will be the same email notifications sent to you. The delegate may be confused to see "Incident assigned to you" emails, so make sure they know they are a delegate.

---

**Service administration**

Configure settings for services that support business applications or the platform.

**Assessments**

Use assessments to evaluate, score, and rank records from any table in the system.
You can assess projects that executives want to evaluate for effective management, or rate and compare a vendor’s goods and services. Use assessments to send custom questionnaires to selected users or write scripts that query the database directly. You can then compare assessment results for the records using unique graphical views designed to highlight key performance information. Share an assessment between ServiceNow instances by using update sets, which is the recommended way to move assessment data from one instance to another.

The Assessments plugin is enabled by default.

You can only edit an assessment that has the same application scope as that of your current session.

### Installed with Assessments

Several types of components are installed with activation of Assessments.

- Demo data is available for assessments and surveys.
- Vendor Performance offers an additional set of vendor assessment demo data.

### Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Description: Assessments</th>
<th>Description: Surveys</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessable Record [asmt_assessable_record]</td>
<td>Stores all assessable records.</td>
<td>For system use only.</td>
</tr>
<tr>
<td>Assessment Category Result [asmt_category_result]</td>
<td>Stores all category results.</td>
<td>For system use only.</td>
</tr>
<tr>
<td>Assessment Category User [asmt_m2m_category_user]</td>
<td>Stores associations between users and metric categories they can assess. A user that is associated to a category is a category user.</td>
<td>Stores associations between users and surveys. A user that is associated to a survey is a survey user and is automatically associated to all the survey's categories.</td>
</tr>
<tr>
<td>Assessment Group [asmt_assessment]</td>
<td>Stores all assessment groups.</td>
<td>For system use only.</td>
</tr>
<tr>
<td>Assessment Instance Question [asmt_assessment_instance_question]</td>
<td>Stores all assessment instance questions, each of which represents one question on one assessment instance.</td>
<td>Stores all survey instance questions, each of which represents one question on one survey instance.</td>
</tr>
<tr>
<td>Assessment Metric [asmt_metric]</td>
<td>Stores all metrics.</td>
<td>Stores all survey questions.</td>
</tr>
<tr>
<td>Assessment Metric Definition [asmt_metric_definition]</td>
<td>Stores all metric definitions.</td>
<td>Stores all answer options for survey questions.</td>
</tr>
<tr>
<td>Table</td>
<td>Description: Assessments</td>
<td>Description: Surveys</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>---------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------</td>
</tr>
<tr>
<td>Assessment Metric Template</td>
<td>Stores all metric templates.</td>
<td>Stores all question templates.</td>
</tr>
<tr>
<td>asmt_template</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assessment Metric Type</td>
<td>Stores all metric types.</td>
<td>Stores all survey definitions.</td>
</tr>
<tr>
<td>asmt_metric_type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assessment Stakeholders</td>
<td>Stores associations between assessable records and category users.</td>
<td>Not used for surveys.</td>
</tr>
<tr>
<td>asmt_m2m_stakeholder</td>
<td>A category user that is associated to an assessable record is a</td>
<td></td>
</tr>
<tr>
<td></td>
<td>stakeholder.</td>
<td></td>
</tr>
<tr>
<td>Assessment Template Definition</td>
<td>Stores all metric template definitions.</td>
<td>Stores all question template definitions.</td>
</tr>
<tr>
<td>asmt_template_definition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assessment X Category Matrix</td>
<td>Allows users to specify metric categories as the X axis of a</td>
<td>Not used for surveys.</td>
</tr>
<tr>
<td>asmt_m2m_xcategory_matrix</td>
<td>decision matrix.</td>
<td></td>
</tr>
<tr>
<td>Assessment Y Category Matrix</td>
<td>Allows users to specify metric categories as the Y axis of a</td>
<td>Not used for surveys.</td>
</tr>
<tr>
<td>asmt_m2m_ycategory_matrix</td>
<td>decision matrix.</td>
<td></td>
</tr>
<tr>
<td>Bubble Chart</td>
<td>Stores all bubble chart definitions.</td>
<td>Not used for surveys.</td>
</tr>
<tr>
<td>asmt_bubble_chart</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Category Assessable Records</td>
<td>Stores associations between assessable records and metric categories.</td>
<td>For system use only.</td>
</tr>
<tr>
<td>asmt_m2m_category_assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decision Matrix</td>
<td>Stores all decision matrices.</td>
<td>Not used for surveys.</td>
</tr>
<tr>
<td>asmt_decision_matrix</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metric Category</td>
<td>Stores all metric categories.</td>
<td>Stores all survey categories.</td>
</tr>
<tr>
<td>asmt_metric_category</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metric Result</td>
<td>Stores all metric results.</td>
<td>Stores all survey responses.</td>
</tr>
<tr>
<td>asmt_metric_result</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signature</td>
<td>Stores all signature records for assessments and [Attestations</td>
<td></td>
</tr>
<tr>
<td>asmt_signature</td>
<td>GRC attestations].</td>
<td></td>
</tr>
<tr>
<td>Trigger Condition</td>
<td>Stores all assessment trigger conditions.</td>
<td>Stores all survey trigger conditions.</td>
</tr>
<tr>
<td>asmt_condition</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Properties

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sn_portal_surveys.sp_survey.email_redirection</td>
<td>Allow a survey accessed from a link in an email to open in the Service Portal (applies only for surveys).</td>
</tr>
<tr>
<td></td>
<td>• Type: Yes/No</td>
</tr>
<tr>
<td></td>
<td>• Default value: no</td>
</tr>
<tr>
<td></td>
<td>• Location:</td>
</tr>
<tr>
<td></td>
<td>• Assessments Admin Assessment Properties</td>
</tr>
<tr>
<td></td>
<td>• Survey Management Administration Properties</td>
</tr>
<tr>
<td></td>
<td>• Learn more: Customize the appearance of a survey on page 2493</td>
</tr>
<tr>
<td>com.snc.assessment.signature_authentication</td>
<td>Require authentication for user signature. When Yes is selected, this property requires credentials for a full name signature.</td>
</tr>
<tr>
<td></td>
<td>• Type: True/False</td>
</tr>
<tr>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td>css.assessment.question.header.background.color</td>
<td>Sets the background color of question headers on assessment and survey questionnaires.</td>
</tr>
<tr>
<td></td>
<td>• Type: color</td>
</tr>
<tr>
<td></td>
<td>• Default value: #767676</td>
</tr>
<tr>
<td></td>
<td>• Location:</td>
</tr>
<tr>
<td></td>
<td>• Assessments Admin Assessment Properties</td>
</tr>
<tr>
<td></td>
<td>• Survey Management Administration Properties</td>
</tr>
<tr>
<td></td>
<td>• Learn more: Customize the appearance of a survey on page 2493</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>css.assessment.caption.background.color</td>
<td>Sets the background color of the caption on assessment and survey questionnaires.</td>
</tr>
<tr>
<td></td>
<td>• Type: color</td>
</tr>
<tr>
<td></td>
<td>• Default value: #eee</td>
</tr>
<tr>
<td></td>
<td>• Location:</td>
</tr>
<tr>
<td></td>
<td>• Assessments Admin Assessment Properties</td>
</tr>
<tr>
<td></td>
<td>• Survey Management Administration Properties</td>
</tr>
<tr>
<td></td>
<td>• Learn more: Customize the appearance of a survey on page 2493</td>
</tr>
<tr>
<td>com.snc.assessment.decision_matrix_filter_max_entries</td>
<td>Sets the maximum number of items to show for a decision matrix field filter.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 1000</td>
</tr>
<tr>
<td></td>
<td>• Location:</td>
</tr>
<tr>
<td></td>
<td>• Assessments Admin Assessment Properties</td>
</tr>
<tr>
<td></td>
<td>• Survey Management Administration Properties</td>
</tr>
<tr>
<td></td>
<td>• Learn more: Customize the appearance of a survey on page 2493</td>
</tr>
<tr>
<td>css.assessment.caption.font.color</td>
<td>Sets the font color of the caption text on assessment and survey questionnaires.</td>
</tr>
<tr>
<td></td>
<td>• Type: color</td>
</tr>
<tr>
<td></td>
<td>• Default value: #ffffff</td>
</tr>
<tr>
<td></td>
<td>• Location:</td>
</tr>
<tr>
<td></td>
<td>• Assessments Admin Assessment Properties</td>
</tr>
<tr>
<td></td>
<td>• Survey Management Administration Properties</td>
</tr>
<tr>
<td></td>
<td>• Learn more: Customize the appearance of a survey on page 2493</td>
</tr>
</tbody>
</table>
User roles

<table>
<thead>
<tr>
<th>Role title [name]</th>
<th>Description</th>
<th>Contains roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>assessment administrator</td>
<td>Can administer the Assessments application. Can access all the modules of</td>
<td>• None</td>
</tr>
<tr>
<td>[assessment_admin]</td>
<td>the Assessments application.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> The assessment_admin role is contained by the itil_admin role.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>It is also contained by the survey_admin role.</td>
<td></td>
</tr>
</tbody>
</table>

Script includes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AssessmentUtils</td>
<td>Core code for assessment functionality.</td>
</tr>
<tr>
<td>AssessmentUtilsAJAX</td>
<td>AJAX based code for displaying scorecard data.</td>
</tr>
<tr>
<td>MigrateSurveyToAssessment</td>
<td>Code for migrating legacy surveys to assessment surveys.</td>
</tr>
<tr>
<td>RatingUtilsAJAX</td>
<td>Reserved for future use.</td>
</tr>
<tr>
<td>SurveyUtils</td>
<td>Core code for survey functionality.</td>
</tr>
</tbody>
</table>

Client scripts

<table>
<thead>
<tr>
<th>Name</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculate Assessable Record Field choice</td>
<td>Trigger Condition</td>
<td>Limits the Assessable Record Field choices to those that are compatible with the selected assessment.</td>
</tr>
<tr>
<td>Field</td>
<td>[asmt_condition]</td>
<td></td>
</tr>
<tr>
<td>Check survey schedule period</td>
<td>Trigger Condition</td>
<td>Checks the selected survey definition's Schedule period. If Schedule period is set to Only Once, this client script displays a warning message that each user can only take the selected survey once.</td>
</tr>
<tr>
<td></td>
<td>[asmt_condition]</td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------------------------------</td>
<td>-------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Clear display_when when depends changed</td>
<td>Assessment Metric [asmt_metric]</td>
<td>Shows the Display when field when the Depends on field is set. Clears the Display when field when the Depends on field changes and the options need to change.</td>
</tr>
<tr>
<td>Conditionally Set Type for Surveys</td>
<td>Group [sys_user_group]</td>
<td>Sets the user group Type to survey if you create a new group from the User Groups module.</td>
</tr>
<tr>
<td>Data type -- Hide choices for surveys</td>
<td>Assessment Metric [asmt_metric]</td>
<td>Ensures only Data type options that are valid for surveys are available on the Survey Question form.</td>
</tr>
<tr>
<td>Data type -- Show/Hide Not Applicable</td>
<td>Assessment Metric [asmt_metric]</td>
<td>Hides the Allow not applicable field and sets its value to false if the metric method is Assessment and the data type is Percentage, Checkbox, Date, Date/Time, Number, or String.</td>
</tr>
<tr>
<td>Datatype defaults to String for surveys</td>
<td>Assessment Metric [asmt_metric]</td>
<td>Sets the default Data type field value to String on the Survey Question form.</td>
</tr>
<tr>
<td>Fetch Min/Max</td>
<td>Assessment Metric [asmt_metric]</td>
<td>Updates the Min and Max fields to match the least and greatest metric template definition values if an assessment administrator selects or changes the Template value.</td>
</tr>
<tr>
<td>Hide Assessable Record Field</td>
<td>Trigger Condition [asmt_condition]</td>
<td>Hides the Assessable Record field unless the evaluation method of the metric type selected in the Assessment field is Assessment.</td>
</tr>
<tr>
<td>Hide assessment if empty</td>
<td>Survey [survey_master]</td>
<td>Hides the Assessment field on the Survey form unless it contains a value. The system populates the Assessment field when you migrate a survey.</td>
</tr>
<tr>
<td>Hide Survey Instance Trigger ID if Empty</td>
<td>Assessment Instance [asmt_assessment_instance]</td>
<td>Hides the Trigger ID field and makes it read-only unless it contains a value.</td>
</tr>
<tr>
<td>Hide user lists</td>
<td>Assessable Record [asmt_assessable_record]</td>
<td>Hides the Category users related list if the associated metric type schedule type is On demand.</td>
</tr>
<tr>
<td>Name</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>--------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Hide user related lists</td>
<td>Metric Category [asmt_metric_category]</td>
<td>Hides the User related list if the associated metric type schedule type is On demand and the Evaluation method is not Survey.</td>
</tr>
<tr>
<td>Hide value or String value</td>
<td>Assessment Instance Question</td>
<td>Hides the Value field and shows the String value field if the associated metric data type is Date, Date/Time, or String. Does the opposite if the data type is anything else.</td>
</tr>
<tr>
<td>Live feed deletion warning</td>
<td>Assessable Record [asmt_assessable_record]</td>
<td>Displays a warning message if an assessment administrator clears the Live feed check box.</td>
</tr>
<tr>
<td>Method -- Show/Hide Not Applicable</td>
<td>Assessment Metric [asmt_metric]</td>
<td>Hides the Mandatory and Allow not applicable fields and sets both values to false if the metric method is Script. Shows the Mandatory field if the metric method is Assessment. Shows the Allow not applicable field if the method is Assessment except when the data type is Percentage, Checkbox, Date, Date/Time, Number, or String.</td>
</tr>
<tr>
<td>Min/Max Control</td>
<td>Assessment Metric [asmt_metric]</td>
<td>Makes the Min and Max fields mandatory except when the data type is Template.</td>
</tr>
<tr>
<td>Min/Max Read-only</td>
<td>Assessment Metric [asmt_metric]</td>
<td>Makes the Min and Max fields read-only when the data type is Choice or Likert Scale.</td>
</tr>
<tr>
<td>Populate Groups</td>
<td>Assessment Metric Type [asmt_metric_type]</td>
<td>Populates the available values for the Filter field with fields from the selected metric type table.</td>
</tr>
<tr>
<td>Read only Type</td>
<td>Metric Category [asmt_metric_category]</td>
<td>Makes the Type field read-only when it contains a value.</td>
</tr>
<tr>
<td>Reload Decision Matrix Filter Columns</td>
<td>Assessment Metric Type [asmt_metric_type]</td>
<td>Populates the available choices for the Default matrix filter as appropriate if the Filter field value changes.</td>
</tr>
<tr>
<td>Reload default filters</td>
<td>Assessment Metric Type [asmt_metric_type]</td>
<td>Populates the available choices for the Default filter as appropriate if the Display all filters value changes.</td>
</tr>
<tr>
<td>Set scale factor</td>
<td>Assessment Metric Type [asmt_metric_type]</td>
<td>Reserved for future use.</td>
</tr>
<tr>
<td>Name</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>---------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Set table field</td>
<td>Metric Category</td>
<td>Sets the category Table value to that of the metric type.</td>
</tr>
<tr>
<td>Show and Hide Scheduled Job</td>
<td>Assessment Metric Type</td>
<td>Hides the Scheduled job field if the Schedule type is On demand and shows the Scheduled job field if the Schedule type is Scheduled.</td>
</tr>
<tr>
<td>Show and Hide Scheduled Job Survey View</td>
<td>Assessment Metric Type</td>
<td>Shows the Scheduled job field on the Survey Definition form if the Schedule period is Daily, Weekly, Monthly, or Yearly.</td>
</tr>
<tr>
<td>Toggle Metric Definitions (Load)</td>
<td>Assessment Metric</td>
<td>Displays the Assessment Metric Definitions related list if the data type is Choice or Likert Scale.</td>
</tr>
<tr>
<td>Toggle Metric Definitions (Update)</td>
<td>Assessment Metric</td>
<td>Displays the Assessment Metric Definitions related list if the data type is Choice or Likert Scale. Sets the Method field to the appropriate value if the data type is compatible with one method only.</td>
</tr>
<tr>
<td>Update Min And Max Default Values</td>
<td>Assessment Metric</td>
<td>Sets reasonable default values for the Min and Max fields, based on the data type.</td>
</tr>
<tr>
<td>Validate Probability</td>
<td>Survey Trigger Condition</td>
<td>Ensures that the Probability (%) value is a whole number between 1 and 100.</td>
</tr>
<tr>
<td>Verify Max</td>
<td>Assessment Metric</td>
<td>Verifies that the Max value is greater than the Min value and greater than or equal to zero if the metric method is Assessment.</td>
</tr>
<tr>
<td>Verify Min</td>
<td>Assessment Metric</td>
<td>Verifies that the Min value is less than the Max value and greater than or equal to zero if the metric method is Assessment.</td>
</tr>
<tr>
<td>Verify Value</td>
<td>Assessment Metric Definition</td>
<td>Verifies that the Value is greater than or equal to zero.</td>
</tr>
<tr>
<td>Verify Value</td>
<td>Assessment Template Definition</td>
<td>Verifies that the Value is greater than or equal to zero.</td>
</tr>
</tbody>
</table>
### Business rules

#### Table 1014: Business rules for Assessments

<table>
<thead>
<tr>
<th>Name</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessable domain matches type</td>
<td>Assessable Record [asmt_assessable_record]</td>
<td>Ensures that all new assessable records are in the same domain as the metric type. This is a special requirement of assessment domain separation, that all records must be in the same domain.</td>
</tr>
<tr>
<td>Auto stakeholder creation</td>
<td>Assessment Category User [asmt_m2m_category_user]</td>
<td>Assigns new category users as stakeholders automatically for assessable records if the associated category has the Create stakeholders check box selected.</td>
</tr>
<tr>
<td>Auto stakeholder creation</td>
<td>Category Assessable Records [asmt_m2m_category_assessment]</td>
<td>Creates stakeholders from all of a category's category users automatically for new assessable records if:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The Create stakeholders check box is selected for the metric category.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The same metric category is associated to the new assessable record.</td>
</tr>
<tr>
<td>Auto stakeholder creation</td>
<td>Metric Category [asmt_metric_category]</td>
<td>Assigns all of a category's category users as stakeholders for each assessable record associated to the category when the Create stakeholders check box is selected for the category.</td>
</tr>
<tr>
<td>Calculate category max weight</td>
<td>Assessment Metric [asmt_metric]</td>
<td>Calculates the sum of all metric weights in a category.</td>
</tr>
<tr>
<td>Cancel notification workflow</td>
<td>Assessment Instance [asmt_assessment_instance]</td>
<td>Cancels the workflow that generates assessment email notifications when an assessment instance is deleted or changes state to Complete or Canceled.</td>
</tr>
<tr>
<td>Name</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>--------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Category domain matches type</td>
<td>Metric Category [asmt_metric_category]</td>
<td>Ensures that all new categories are in the same domain as the metric type. This is a special requirement of assessment domain separation, that all records must be in the same domain.</td>
</tr>
<tr>
<td>Check Live Feed Groups</td>
<td>Assessable Record [asmt_assessable_record]</td>
<td>Selects the Live feed check box if a live feed group is associated with the source record. If the Live feed check box is selected and no live feed group is associated with the source record, this business rule clears the check box.</td>
</tr>
<tr>
<td>Check only one default</td>
<td>Bubble Chart [asmt_bubble_chart]</td>
<td>Ensures there is only one default bubble chart for a metric type.</td>
</tr>
<tr>
<td>Check only one default</td>
<td>Decision Matrix [asmt_decision_matrix]</td>
<td>Ensures there is only one default decision matrix for a metric type.</td>
</tr>
<tr>
<td>Create actual results</td>
<td>Assessment Instance [asmt_assessment_instance]</td>
<td>Generates assessment and category results from the user responses if a user completes an assessment.</td>
</tr>
<tr>
<td>Name</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>---------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Create Business Rule on Remote table</td>
<td>Assessment Metric Type [asmt_metric_type]</td>
<td>Generates the following business rules if an assessment administrator creates or updates a metric type:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Business rule called Auto business rule for Assessments, which monitors the Table selected for the metric type. When someone adds a record that meets the metric type conditions, this business rule generates an assessable record. If someone changes the metric type's Table or conditions, the Create Business Rule on Remote table business rule updates the automatic business rule script to reflect the changes.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Business rule called Auto deletion rule for Assessments, which prevents users from deleting a record on the metric type's Table if the record is associated to metric or category results. If the record has no associated results and a user deletes it, this business rule deletes any associated assessable records.</td>
</tr>
</tbody>
</table>

The Create Business Rule on Remote table business rule generates automatic business rules only for metric types with Evaluation method set to Assessment.
<table>
<thead>
<tr>
<th>Name</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
</table>
| Create Scheduled Job              | Assessment Metric Type [asmt_metric_type]| Assessments: Generates a scheduled job for the creation of assessment components if either of these conditions is met:  
  • Someone creates a new metric type with the schedule type set to Scheduled.  
  • The schedule type changes from On demand to Scheduled.  
Surveys: Generates a scheduled job for the creation of survey components if the schedule period for a survey definition is set to Daily, Weekly, Monthly, or Yearly. |
<p>| Create Survey Records             | Assessment Metric Type [asmt_metric_type]| Generates various records and populates certain fields on those records when someone creates a new survey definition, which is a metric type with Evaluation method set to Survey. More specifically, this business rule generates a survey category and assessable record, both associated to the survey definition. |
| Create UI Action on Remote table  | Assessment Metric Type [asmt_metric_type]| Reserved for future use.                                                                                                                                                                                      |
| decision_matrix_axis              | Global [global]                          | Limits available categories for X- and Y-axes to those that belong to the type if there is a metric type specified on the Decision Matrix form.                                                                 |
| Delete Live Feed Group            | Assessable Record [asmt_assessable_record]| Deletes the assessable record's live feed group, if there is one, when an assessment administrator deletes an assessable record.                                                                 |
| delete related users              | Category Assessable Records [asmt_m2m_category_assessment]| Deletes any stakeholders for the assessable record and category when an assessment administrator disassociates a category from an assessable record.                                                                 |</p>
<table>
<thead>
<tr>
<th>Name</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not allow category to change</td>
<td>Assessment Metric [asmt_metric]</td>
<td>Prevents the Category field from being changed if there are any conditional question dependencies related to the current record.</td>
</tr>
<tr>
<td>Do not allow datatype to change</td>
<td>Assessment Metric [asmt_metric]</td>
<td>Prevents the Data type and Template fields from being changed if there are any conditional questions that depend on the current record.</td>
</tr>
<tr>
<td>Ensure Types Match</td>
<td>Assessment Metric [asmt_metric]</td>
<td>Sets the type of a metric to the type of the associated category.</td>
</tr>
<tr>
<td>Ensure types match</td>
<td>Assessment Stakeholders [asmt_m2m_stakeholder]</td>
<td>Ensures users can only create a stakeholder from a category user and assessable record of the same type.</td>
</tr>
<tr>
<td>Ensure types match</td>
<td>Category Assessable Records [asmt_m2m_category_assessment]</td>
<td>Prevents users from associating categories of one type to an assessable record of a different type.</td>
</tr>
</tbody>
</table>
| Evaluate filters                          | Assesasurable Record [asmt_assessable_record] | Performs the following after the system generates a new assessable record:  
  • Checks all filter conditions for categories in the type.  
  • Automatically associates the new assessable record to all categories for which it meets the category filter conditions. |
<p>| Generate assessment trigger condition     | Trigger Condition [asmt_condition]   | Generates a business rule the survey or assessment trigger condition uses to send surveys or assessments.                                  |
| getStakeholders                           | Global [global]                      | Ensures that only category users for categories associated with the assessable record are available on the Assessable Record form when users edit the Category users related list. |</p>
<table>
<thead>
<tr>
<th>Name</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Link assessable record and category</td>
<td>Metric Category [asmt_metric_category]</td>
<td>Sets these hidden fields as follows for a newly created survey category: • Table: Assessment Metric Type [asmt_metric_type] • Filter: &lt;sys_id of the survey definition the new survey category is associated with&gt;</td>
</tr>
<tr>
<td>Live Feed Group</td>
<td>Assessable Record [asmt_assessable_record]</td>
<td>Creates a live feed group for the assessable record, if one does not exist, when the record is saved with the Live feed check box selected. If the check box is then cleared and the record saved, this business rule deletes an existing live feed group.</td>
</tr>
<tr>
<td>Metric domain matches category</td>
<td>Assessment Metric [asmt_metric]</td>
<td>Ensures that all new metrics are in the same domain as the category to which they belong. This is a special requirement of assessment domain separation, that all records must be in the same domain.</td>
</tr>
<tr>
<td>Notify assessment user</td>
<td>Assessment Instance [asmt_assessment_instance]</td>
<td>Starts a workflow that sends an email notification to the assigned user when an assessment instance changes to the Ready state or the user to which it is assigned changes. The workflow generates other assessment email notifications at later stages.</td>
</tr>
<tr>
<td>Prevent recursive dependencies</td>
<td>Assessment Metric [asmt_metric]</td>
<td>Prevents the Depends on field from being set in a way that creates a recursive conditional question dependency.</td>
</tr>
<tr>
<td>Publish Survey</td>
<td>Assessment Metric Type [asmt_metric_type]</td>
<td>Generates survey instances and assigns them to the associated survey users when the survey definition state changes from Draft to Published.</td>
</tr>
<tr>
<td>Remove auto create Business Rules</td>
<td>Assessment Metric Type [asmt_metric_type]</td>
<td>Deletes the automatically created business rule for a metric type when an assessment administrator deletes that metric type.</td>
</tr>
<tr>
<td>Name</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>--------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Remove auto create UI Actions</td>
<td>Assessment Metric Type [asmt_metric_type]</td>
<td>Reserved for future use.</td>
</tr>
<tr>
<td>Remove auto created business rule</td>
<td>Survey Trigger Condition [asmt_condition]</td>
<td>Deletes the automatically created business rule when someone deletes the survey trigger condition.</td>
</tr>
</tbody>
</table>
| Remove Scheduled Job                           | Assessment Metric Type [asmt_metric_type]  | **Assessments:** Deletes the scheduled job for a metric type if either of these conditions is met:  
  • Someone deletes the metric type.  
  • Someone changes the schedule type from Scheduled to On demand.  
**Surveys:** Deletes the scheduled job for a survey definition if the schedule period is set to Only Once or No Limit. |
<p>| Reset Min/Max for metric                       | Assessment Metric Definition [asmt_metric_definition] | Updates the Min and Max fields for metrics and survey questions based on the metric definition Value.                                     |
| Set Domain for M2M Cat Assessable Recs         | Category Assessable Records [asmt_m2m_category_assessment] | Ensures that assessable records are only associated to categories in the same domain. This is a special requirement of assessment domain separation, that all records must be in the same domain. |
| Set Domain for M2M Category Users              | Assessment Category User [asmt_m2m_category_user] | Ensures that users are only linked to categories in the same domain. This is a special requirement of assessment domain separation, that all records must be in the same domain. |
| Set Domain for M2M Stakeholders                | Assessment Stakeholders [asmt_m2m_stakeholder] | Ensures that assessable records are only linked to category users in the same domain. This is a special requirement of assessment domain separation, that all records must be in the same domain. |</p>
<table>
<thead>
<tr>
<th>Name</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set scratchpad fields</td>
<td>Assessment Metric Type [asmt_metric_type]</td>
<td>Caches field values for use by other scripts that run on the Assessment Metric Type form.</td>
</tr>
<tr>
<td>Store view type</td>
<td>Metric Category [asmt_metric_category]</td>
<td>Ensures that the Type field only allows users to select metric types used for assessments.</td>
</tr>
<tr>
<td>Synchronize category survey users</td>
<td>Assessment Category User [asmt_m2m_category_user]</td>
<td>Ensures that the same users are associated with all of a survey's categories.</td>
</tr>
<tr>
<td>Synchronize survey users and stakeholder.</td>
<td>Metric Category [asmt_metric_category]</td>
<td>Adds all users associated with a survey's existing categories to any newly created category for that survey.</td>
</tr>
<tr>
<td>Update Category Count</td>
<td>Assessment Metric [asmt_metric]</td>
<td>Updates the value in the Total metrics field on the Metric Category form when metrics are added to and deleted from the category.</td>
</tr>
</tbody>
</table>
| Update records that match filter          | Metric Category [asmt_metric_category]      | Automatically performs these tasks when an assessment administrator edits the Filter field:  
• Associates the category to assessable records that meet the filter conditions.  
• Disassociates the category from assessable records that do not meet the filter conditions.  
The Assessable records related list reflects these changes when the record is saved. |
| Update scheduled job on schedule change    | Assessment Metric Type [asmt_metric_type]   | Updates the survey creation scheduled job to reflect schedule period changes. |
| Validate mandatory and not applicable     | Assessment Metric [asmt_metric]             | Sets the Mandatory and Allow not applicable fields to false if the metric method is Script. If the metric data type is Percentage, the business rule sets the Allow not applicable field to false. |
| Verify min/max                            | Assessment Metric [asmt_metric]             | Ensures that the Min is greater than or equal to zero and less than the Max. Sets the Min to 0 and the Max to 1 if the data type is Checkbox or Yes/No. |
Assessment administrator tasks

Before you create assessments, assign the assessment_admin role to the appropriate users in your organization and determine your objectives for the assessment.

Decide which sets of records in the system to assess, which themes you are interested in, and which traits to measure. Consider your organization's options for obtaining the data to compare. If you intend to use assessment questionnaires, consider which people can answer the questions.

Assessment terminology

Assessment admins use several terms when working with assessments.

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metric type</td>
<td>A metric type defines a set of records to evaluate, such as vendors, projects, or employees.</td>
</tr>
<tr>
<td>Assessable record</td>
<td>An assessable record links a record to evaluate, such as the company record for Amazon or the user record for a sales representative, to a metric type, such as vendors or employees. You define sets of assessable records when you create metric types.</td>
</tr>
<tr>
<td>Metric category</td>
<td>A metric category represents a theme for evaluating assessable records. Categories contain one or more individual metrics, which define specific traits or values that comprise the theme. Examples of categories include overall vendor performance or quality of delivery services. You can also set filter conditions that control which assessable records to evaluate for the metrics in a category.</td>
</tr>
<tr>
<td>Term</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Metric</td>
<td>A <em>metric</em> is a trait or value used to evaluate assessable records. A metric can measure subjective values in an assessment questionnaire, or gather objective values in a database query run by a script. Examples of metrics include perceived courtesy of sales representatives or number of incidents per vendor.</td>
</tr>
<tr>
<td>Category user</td>
<td>A <em>category user</em> is a person who knows about a specific category. One person can be a category user for multiple categories. Examples of category users include a vendor manager who oversees all purchasing operations or a supervisor of a sales team.</td>
</tr>
<tr>
<td>Stakeholder</td>
<td>A <em>stakeholder</em> is a category user who knows about a specific assessable record. Examples of stakeholders include a vendor manager who coordinates purchases from Amazon or a supervisor of a sales team who manages a specific employee.</td>
</tr>
</tbody>
</table>
| Assessment instance| An *assessment instance* represents one assessment questionnaire assigned to one user. The system generates a new assessment instance for each assigned user when:  
  - The assessment generation scheduled job runs.  
  - An assessment administrator creates an on-demand assessment. |
| Scorecard          | A *scorecard* provides a visual illustration of an assessable record's performance, based on assessment results. Use scorecards to view a variety of data summaries for one assessable record and to compare the ratings with other assessable records.                                                      |
| Decision matrix    | A *decision matrix* is a graph with two axes that plots the assessment results for multiple assessable records. Use decision matrixes to determine the relative standing of assessable records in selected categories.                                                                                       |
| Bubble chart       | A *bubble chart* is a graph with three axes that plots the assessment results for multiple assessable records. Use bubble charts to determine the relative standing of assessable records in selected categories, with an emphasis on one category.                                                                    |
Assessment roles

The Assessments application requires certain roles to perform assessment tasks. No role is required to take assessment questionnaires that are assigned to you.

<table>
<thead>
<tr>
<th>Role Title</th>
<th>Role Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment administrator</td>
<td>assessment_admin</td>
<td>Assessment administrators set up assessments. They know which records to evaluate, the criteria on which to evaluate the records, and who to assign assessments to.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> By default, users with the assessment_admin role have limited system rights and might not have access to all source records to assess. When planning assessments, grant additional roles to assessment administrators as needed. For example, to create and manage vendor assessments, the assessment administrator must also have the vendor_manager role, which grants access to the Company table and other relevant tables.</td>
</tr>
<tr>
<td>ITIL user</td>
<td>itil</td>
<td>ITIL users perform basic technician operations in the system. In the Assessments application, they have read access to the Assessable Record table.</td>
</tr>
<tr>
<td>Administrator</td>
<td>admin</td>
<td>Administrators have access to all aspects of the assessment process. Only administrators can set up assessment schedules.</td>
</tr>
</tbody>
</table>

Assessment methods

The available methods are Assessment, for non-scripted metrics, and Script, for scripted metrics. Each method serves a different function and can be used with certain data types.
Use the Method field to specify how to use the metric.

**Assessment method**

Metrics with the Method set to Assessment are called non-scripted metrics. Use each non-scripted metric to define a question for assessment questionnaires. Non-scripted metrics are useful if you want to obtain subjective data like personal opinions.

You can use the Assessment method with these Data type values:

- Attachment
- Checkbox
- Choice
- Date
- Date/Time
- Likert Scale
- Number
- Percentage
- String
- Template
- Yes/No

**Script method**

Metrics with the Method set to Script are called scripted metrics. Use each scripted metric to define a custom script for database queries. Scripted metrics are useful if your system contains reliable data for the traits you want to evaluate.

You can use the Script method with these Data type values:

- Duration
- Number
- Percentage

Use the Script field to write JavaScript code. By default, the field contains information about available variables and an example, which you can use as the basis of your script or replace entirely:

```
// The following variables are available:
// actual_result: the script sets the actual value for this metric to this variable
// scaled_result: the script sets the scaled value (used in calculations) for this metric to this variable

// For example:
var gr = new GlideRecord('cmdb_ci');
gr.addquery('manufacturer', primary);
gr.query();
actual_result = gr.getRowcount();
if (actual_result > 100) scaled_result = 5;
else scaled_result = 1;
```

**Figure 422: Metric form script field**
You must use the following variables in your script:

- **primary**: Input variable used to access the sys_id of the record being assessed.
- **actual_result**: Output variable that contains the actual value for this metric. The system uses this variable to populate the Actual value field on the Metric Result form. For each actual_result, you must specify a corresponding scaled_result value.
- **scaled_result**: Output variable that contains a numerical scaled value to represent an actual value. The system uses this variable to populate the Scaled value field on the Metric Result form. Ensure the scaled values you specify are between or equal to the Min and Max values for the metric. The Scale definition field determines how the system uses the scaled value. A scale definition of Low means smaller numbers are better, such as for a metric that measures the number of incidents for a vendor. High means larger numbers are better, such as for a metric that measures user satisfaction on a scale of one to five.

**Script example**

The metric Number of active devices uses the script pictured below. The primary variable is used to find CIs that are associated to the vendor record being assessed. The script retrieves the actual_result, the number of CIs associated to the vendor, then calculates the correct scaled_result. The script uses a series of scaled values, from the Min to the Max value, to represent actual values. Because the Scale definition is set to High, the greatest scaled values are best, meaning a vendor associated to the most CIs scores highest. The system stores the actual and scaled values in a metric result record for the vendor.
Data types for assessments

Metric data types have functions that depend on the method that you select.

Table 1015: Assessment data types

<table>
<thead>
<tr>
<th>Data type</th>
<th>Compatible methods</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attachment</td>
<td>Assessment</td>
<td>On questionnaires, users attach one or more files to a question.</td>
</tr>
<tr>
<td>Data type</td>
<td>Compatible methods</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Checkbox</td>
<td>Assessment</td>
<td>On questionnaires, users select a check box next to a statement or leave it cleared. Set the Scale definition field to High if a selected check box equates to a good score.</td>
</tr>
<tr>
<td>Choice</td>
<td>Assessment</td>
<td>On questionnaires, users select a value from a list of custom answer options. Create a metric definition for each answer option.</td>
</tr>
<tr>
<td>Data type</td>
<td>Compatible methods</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>--------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>Date</td>
<td>Assessment</td>
<td>On questionnaires, users select a date.</td>
</tr>
<tr>
<td>Date/Time</td>
<td>Assessment</td>
<td>On questionnaires, users select a date and time.</td>
</tr>
<tr>
<td>Data type</td>
<td>Compatible methods</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>--------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Duration</td>
<td>Script</td>
<td>When the script runs, the system populates the Duration value and Scaled value fields on the Metric Result form with the appropriate values from the actual_result and scaled_result variables in the metric script.</td>
</tr>
<tr>
<td>Likert Scale</td>
<td>Assessment</td>
<td>On questionnaires, users select a value from a custom scale of answer options. Create a metric definition for each answer option, which is represented by a radio button on the scale. A Likert scale metric that evaluates an application's ease of use might have the metric definitions Easy, Average, and Difficult. If you want to reuse a series of answer options for multiple metrics, create a metric template and use the Template data type instead of the Likert Scale data type.</td>
</tr>
<tr>
<td>Number</td>
<td>Assessment, Script</td>
<td>Assessment: On questionnaires, users enter a number. Script: When the script runs, the system populates the Actual value and Scaled value fields on the Metric Result form with the appropriate values from the actual_result and scaled_result variables in the metric script.</td>
</tr>
<tr>
<td>Data type</td>
<td>Compatible methods</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| Percentage | Assessment, Script | Assessment On questionnaires, users enter a number.  
<p>|           |                    | Script When the script runs, the system populates the Actual value and Scaled value fields on the Metric Result form with the appropriate values from the actual_result and scaled_result variables in the metric script. |</p>
<table>
<thead>
<tr>
<th>Data type</th>
<th>Compatible methods</th>
<th>Description</th>
</tr>
</thead>
</table>
| String    | Assessment         | On questionnaires, users enter text. The size of the string field depends on the String option you select:  

![Figure 424: String single line wide data type](image)

| Template  | Assessment         | On questionnaires, users select a value from a predefined series of answer options. There must be at least one template defined to use this data type. For a template, there is a template definition for each answer option, which is represented by a radio button.  

![Additional comments](image)
<table>
<thead>
<tr>
<th>Data type</th>
<th>Compatible methods</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes/No</td>
<td>Assessment</td>
<td>On questionnaires, users select Yes or No from a list. Set the Scale definition field to High if selecting Yes equates to a better score.</td>
</tr>
</tbody>
</table>

Configure an assessment

Configure an assessment to evaluate, score, and rank records from any table in the system.

Role required: admin or assessment_admin

1. Navigate to Assessments Metric Definition Types.
2. Click New.
3. Enter the field information.

Table 1016:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the assessment.</td>
</tr>
<tr>
<td>Assessment duration</td>
<td>Allowed duration to complete an assignment after its generation.</td>
</tr>
<tr>
<td>Live feed</td>
<td>Checkbox that automatically creates live feed groups for newly generated assessable records of this type.</td>
</tr>
<tr>
<td>Notify manager if overdue</td>
<td>Checkbox to send a notification to the manager when the assessment becomes overdue.</td>
</tr>
<tr>
<td>Scale factor</td>
<td>Scale value for all assessment results.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Pagination setting for Service Portal view</td>
<td>The setting on which the pagination is based for desktop or tablet view in Service Portal.</td>
</tr>
<tr>
<td></td>
<td>• Category: default</td>
</tr>
<tr>
<td></td>
<td>• Question: 1 question per page</td>
</tr>
<tr>
<td></td>
<td>• None: no pagination</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This field is displayed only when Service Portal is installed.</td>
</tr>
<tr>
<td>Business rule</td>
<td>Business rule that is automatically created for assessable record generation.</td>
</tr>
<tr>
<td>Schedule type</td>
<td>Scheduled or on-demand assessment type.</td>
</tr>
<tr>
<td>Scheduled job</td>
<td>Scheduled job the system creates for this assessment definition when the schedule period is a repeating interval. The system sets the scheduled job to run according to the selected schedule period. If you change the schedule period and save the survey definition:</td>
</tr>
<tr>
<td></td>
<td>• The system deletes the old scheduled job.</td>
</tr>
<tr>
<td></td>
<td>If you selected a recurring schedule period:</td>
</tr>
<tr>
<td></td>
<td>• A new scheduled job is created.</td>
</tr>
<tr>
<td></td>
<td>For example, if you change the schedule period from Daily to Weekly and save the record:</td>
</tr>
<tr>
<td></td>
<td>• The system deletes the daily scheduled job.</td>
</tr>
<tr>
<td></td>
<td>• Creates a weekly one set to run a week from the current date.</td>
</tr>
<tr>
<td></td>
<td>This field is visible to administrators only if the schedule period is Daily, Weekly, Monthly, or Yearly.</td>
</tr>
<tr>
<td>Evaluation method</td>
<td>Type of assessment.</td>
</tr>
<tr>
<td>Roles</td>
<td>Roles with read access for this metric type.</td>
</tr>
<tr>
<td>Active</td>
<td>Check box to enable the distribution of this assessment to recipients.</td>
</tr>
<tr>
<td>Description</td>
<td>Description of the assessment.</td>
</tr>
<tr>
<td>Conditions</td>
<td></td>
</tr>
<tr>
<td>Table</td>
<td>Table that contains records to assess for this type.</td>
</tr>
</tbody>
</table>
## Field

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enforce condition</td>
<td>Checkbox to delete the existing assessable records of this type that do not meet the specified conditions.</td>
</tr>
<tr>
<td>Condition</td>
<td>Conditions that the assessable records of this type should meet.</td>
</tr>
<tr>
<td>Decision Matrix</td>
<td></td>
</tr>
<tr>
<td>Filter field</td>
<td>Field on the Filter table to identify filter menu choices on decision matrices and scorecard averages for this type.</td>
</tr>
<tr>
<td>Filter condition</td>
<td>Conditions to filter results on decision matrices and scorecard averages for this type.</td>
</tr>
<tr>
<td>Default matrix filter</td>
<td>Default filter menu choice on decision matrix of this type.</td>
</tr>
<tr>
<td>Related Links</td>
<td></td>
</tr>
<tr>
<td>Generate Assessable Records</td>
<td>Creates assessable records for this metric type.</td>
</tr>
<tr>
<td>Show Benchmarks</td>
<td>Opens the Benchmarks Dashboard that provides visibility into your key performance indicators (KPIs) and trends.</td>
</tr>
</tbody>
</table>

### Note:
- This related link is available only for survey_admin, assessment_admin and survey_reader with bm_viewer role.
- You must opt in to Benchmarks to view the dashboard. See *Enable Benchmarks*
- This is applicable only for a published survey.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create Improvement Initiative</td>
<td>Opens the Improvement Initiative window to create an improvement initiative record that helps in improving the performance of the assessment. Note: • This related link is available only for the survey_admin and assessment_admin role. A survey_reader can only view the created improvement initiative records. • You should activate the Continual Improvement Management plugin (com.sn_cim).</td>
</tr>
</tbody>
</table>

**Related Lists**

<table>
<thead>
<tr>
<th>Metric Categories</th>
<th>All metric categories for this assessment.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessable Records</td>
<td>All assessable records for this assessment.</td>
</tr>
<tr>
<td>Improvement Initiatives</td>
<td>Displays improvement initiatives associated with the survey. Note: This related list is available only when there is at least one improvement initiative record.</td>
</tr>
</tbody>
</table>

**Assessment generation**

In the Assessments application, administrators or assessment administrators can trigger the system to generate scheduled assessments or on-demand assessments when all the prerequisite steps are completed.

An assessment administrator must publish the metric type to enable assessment generation.

The system performs these tasks when it generates assessments:

- Creates assessment questionnaires from non-scripted metrics and assigns the questionnaires to users. When users complete their assigned questionnaires, the system uses their responses to calculate assessment results.
- Runs scripted metrics from each category to query the database and calculate assessment results.

Each time the system generates assessments, it creates some or all of the following components. Consider having an administrator set a schedule for recurring data cleanup, as the system can potentially generate a considerable amount of assessment data.

- **Assessment group**
- **Assessment instances**
- **Assessment results**
Assessment groups

An assessment group is a container for assessment instances and assessment results generated in a single occurrence.

The system generates an assessment group every time the scheduled job runs or the API is called, when there is at least one assessable record associated to a category in the type. You can find assessment group records in Assessments Assessment Groups.

The Assessment Group form displays the group Number, the associated Metric type, and these related lists:

- **Assessment Instances**: Lists all assessment instances within this group. There may be no records in this related list. The system does not generate assessment instances if there are only scripted metrics for the type.
- **Metric Results**: Lists all metric results for this group. There may be no records in this related list initially. The system generates metric results immediately for scripted metrics, but not for non-scripted metrics, which appear as questions on assessments and require user response. The system dynamically updates the records in this list as users complete assessment questionnaires.
- **Assessment Category Results**: Lists all category results for this group. There may be no records in this related list initially. The system generates category results immediately if there are only scripted metrics in a category. Otherwise, the system does not calculate category results until a user completes an assessment questionnaire that contains questions from the category.

**Note**: To prevent the loss of important assessment data, you cannot delete an assessment group if it contains any assessment instances, metric results, or category results.

Create an assessment category

Assessment categories are used with assessment metric types and assessment metrics to generate bubble charts.

**Role required**: it_pps_admin

The Demand Management application comes with the Demand assessment metric type, five assessment metric categories, and assessment metrics. From the Assessment Categories section of the application menu, you can modify existing assessment categories and create ones.

1. Navigate to Project Administration Settings Assessments Metric Categories.
2. Click New to create a new record.
3. Fill in the fields and click Submit.

### Table 1017: Default demand management assessment categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>Assesses demand size relative to the size of other demands.</td>
</tr>
<tr>
<td>Strategic Alignment</td>
<td>Assesses how closely the demand aligns with strategic goals of the organization compared to other demands.</td>
</tr>
<tr>
<td>Risk</td>
<td>Assesses demand risks compared to other demands.</td>
</tr>
<tr>
<td>ROI</td>
<td>Assesses demand return on investment compared to other demands.</td>
</tr>
</tbody>
</table>
Assessment metric categories

In the Assessments application, a metric category represents a theme for evaluating assessable records in a given metric type.

Each category has a numeric weight value to indicate its importance relative to other categories. Within a category, records called metrics are the traits or values used to evaluate assessable records. For example, there are many categories within the Vendor metric type, including Support Rating, which contains metrics that measure the quality of vendors’ customer support services. Assessable records must be associated to categories to be eligible for evaluation. Assessment administrators create categories and manage which assessable records each category is associated to.

Weight categories and metrics

When you create a metric category or metric, you must specify a weight, a numeric value that indicates the importance of the category or metric relative to other categories and metrics.

The greater the weight value, the more important the item is. The system uses weight values in assessment result calculations. Consider these recommendations when choosing weight values.

• Determine a weighting scale and use it consistently. In general, use a scale with a small numeric range. A standard 1-10 scale is usually appropriate, where 1 is least and 10 most important. Understand that increasing the maximum value of a weighting scale impacts all related result calculations.
• Use the same weighting scale for metric categories and metrics. Though there is no limitation, consider using the same or very similar weighting scales for both categories and metrics to make it easier to remember which values to use. A scale of 1-10 is an effective and simple weighting system, but may not be suitable for all organizations.

Note: If you do not want to use weighting, set the same weight value for all categories and metrics. The default weight value is 10.

Create a category for assessable records

After you create a metric type and generate assessable records, create categories for the themes you are interested in using to evaluate the assessable records.

Role required: none

1. Navigate to Assessments Metric Definition Categories.
2. Click New to create a new metric category and then complete the Metric Category form:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the metric category. The name appears on assessment questionnaires.</td>
</tr>
<tr>
<td>Type</td>
<td>[Required] Metric type this category is used for. Metrics in this category can be used to evaluate assessable records for the type you select. This field becomes read-only after you save the record.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Create stakeholders</td>
<td>Check box that enables (selected) or disables (cleared) automatic stakeholder creation for this category. When the check box is selected, the system makes all associated category users stakeholders for each assessable record associated to this category. This saves the time required to manually create stakeholders. For more information, see Create Stakeholders Automatically. Existing stakeholders are not impacted if you clear the check box.</td>
</tr>
<tr>
<td>Table</td>
<td>[Read-Only] Table that contains the records to evaluate with metrics in this category. The system automatically populates this field with the same table as the metric type selected. The table does not appear in the field until you save the form. This field is visible depending on whether a Type is selected.</td>
</tr>
<tr>
<td>Weight</td>
<td>[Required] Numerical value that represents the importance of this category relative to other categories. A greater value indicates greater importance. For more information, see weight categories and metrics. The default value is 10.</td>
</tr>
<tr>
<td>Scoring type</td>
<td>Scoring method for an attestation category. This field appears only when the metric type is an attestation with a Scoring type of Percent. Use this field to configure different scoring types for specific attestation categories. Possible selections are: • Percent: Attestation score as a weighted percentage of correct answers for scored questions. • All or nothing: All answers for attestation type questions must be correct or the score is zero for the entire category.</td>
</tr>
<tr>
<td>Total metrics</td>
<td>[Read-Only] Number of metrics associated to this category.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Filter</td>
<td>Filter conditions that assessable records must meet to be evaluated using metrics in this category. The filter operates on fields on the selected table. If you specify a filter condition, the system automatically associates matching assessable records to the category when you save the record. If you change the filter conditions, the system removes and creates assessable record associations as needed. The system also deletes stakeholders for assessable records it disassociates. The system does not remove assessable record associations created by users, even if the assessable records do not match the filter conditions. This field is visible only when a Type is selected.</td>
</tr>
<tr>
<td>Description</td>
<td>Descriptive information about the category that appears on assessment questionnaires.</td>
</tr>
<tr>
<td>Roles</td>
<td>Only those users with the specified roles can perform the assessment for this category. If no role is specified, then users with any role can perform the assessment for this category.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> If the Roles property does not appear on the form, ask your admin to add the property.</td>
</tr>
<tr>
<td>Details</td>
<td>Text field containing an HTML editor. Use this field to present important details about this category to assessment recipients. Details can include formatted lists, images, videos, or links to external websites. You may need to configure the form to see this field.</td>
</tr>
<tr>
<td>Related Lists</td>
<td>Assessment Metrics: All metrics associated to this category. There must be at least one metric associated to the category to use any assessments with the category.</td>
</tr>
<tr>
<td></td>
<td>Assessable records: All assessable records associated to this category. There must be at least one assessable record associated to the category to use any assessments with the category. This related list is hidden if the Evaluation method is Attestation.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Users</td>
<td>All users associated to this category. There must be at least one category user to create scheduled assessments using metrics in this category. This related list is available only when the associated metric type has schedule type set to Scheduled. Category users are not a part of the on-demand assessment process.</td>
</tr>
</tbody>
</table>

Assessable record associations

Only the assessable records associated to a category can be evaluated using metrics in that category. Manage which assessable records you evaluate for each category by creating and removing the associations.

Manage which assessable records you evaluate for each category by creating and removing the associations.

**Note:** You can also manage which categories an assessable record is associated to using the Assessable Record form.

Manage an assessable record automatically

You must define at least one filter condition in the Metric Category form to automatically associate assessable records with the category.

Role required: assessment_admin or admin

1. Navigate to Assessments Metric Definition Categories.
2. Open a category.
3. In the Filter field, create a condition statement that defines the records you want to associate to this category. The available fields are from the table defined for the metric type.
   
   For example, for a category in the Vendor type, you might create the condition `[Country] [is] [Germany]`. Metrics in the category will be used only to evaluate vendors that meet this condition.
4. Save the record.
   
   The system associates this category to all assessable records that match the filter condition. As the system generates new assessable records that match the condition, it associates them to this category. If you change the filter condition, the system removes and creates assessable record associations, as appropriate. Note the following:

   - The system does not remove assessable record associations created manually, even if the assessable records do not match the filter conditions.
   - The system deletes any related stakeholders, if applicable, when it disassociates assessable records from a category.
   - The system does not create or remove assessable record associations if the related source records change. For example, consider the previous example in which all assessable records for vendors based in Germany were associated to a particular category. Assume that a user changes the Country of one of the vendor records from Germany to Canada. The system does not disassociate the related assessable record from the category, even though it no longer matches the filter condition.

   **Note:** To configure the system to automatically associate all assessable records from a metric type to a category, use the same category condition as the metric type condition. For example,
if the Vendor metric type has the condition [Vendor] [is] [true], create the same condition for the category. If the metric type does not have a condition specified, you can use the category condition [Sys ID] [is not empty], which includes all records from any table.

Manage an assessable record manually

You can manually create and remove assessable record associations for a category using a related list on the Metric Category form.

Role required: assessment_admin or admin

Keep in mind that when you disassociate an assessable record from a category, the system deletes any related stakeholders, if applicable, and you can no longer evaluate the assessable record using metrics in that category.

1. Navigate to Assessments Metric Definition Categories.
2. Open a category.
3. In the Assessable records related list, click Edit and use the slushbucket to add or remove one or more assessable records.

Only assessable records associated to this category's metric type are available for selection.

Delete a category

When you delete a category, the system also deletes the associated category users and stakeholders.

Role required: assessment_admin or admin

1. Navigate to Assessments Metric Definition Categories.
   Alternatively, navigate to a record that contains a related list for categories.
2. Open a record from the list.
3. On the Metric Category form, click Delete.
4. Click OK when asked to confirm the action.

The system displays messages at the top of the form describing the actions taken.

Assessment metrics

In the Assessments application, a metric is a trait or value used to evaluate assessable records.

Depending on the metric method, a metric can be used as either of the following:

- A question on assessment questionnaires, to obtain a subjective value such as how much people enjoy using each cell phone offered in the service catalog.
- A script that queries the database, to obtain an objective value such as the number of incidents related to each cell phone.

Each metric is associated to one metric category and can be used to evaluate assessable records for that category only. For example, the Support Rating category contains metrics that measure the quality of vendors' customer support services. One metric addresses the quality of product documentation. Others address the strength of the user community, self-service options, online training, and other support services. Each metric has a numeric weight value to indicate its importance relative to other metrics in the same category.

Assessment administrators can create and administer metrics and metric templates, which define reusable sets of answer options for metrics used as assessment questions. If you decide to use metric templates, you may want to create them before you create metrics.

Note: Changes to assessment metrics and metric templates are reflected in assessment questionnaires and results, even if users have saved responses already. If possible, avoid
changing the original meaning of a metric question, the data type, or any metric templates in use by existing assessments.

Create a metric for a category

After you create a category, create metrics you can use to evaluate the assessable records for that category.

Role required: assessment_admin or admin

When you create metrics, consider the focus of the category and what characteristics you want to measure for the items you will assess. If you plan to use metrics for assessment questionnaires, you may want to review tips for writing good questions.

1. Navigate in one of the following ways:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessments Metric Definition Categories</td>
<td>Open a category, and locate the Assessment Metrics related list. This is the suggested navigation path, as the system links metrics to the category from which they are created.</td>
</tr>
</tbody>
</table>

**Assessments Metric Definition Metrics**

2. Click New.

3. Fill in the fields, as appropriate.

Table 1018: Assessment Metric form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the metric.</td>
</tr>
<tr>
<td>Category</td>
<td>Metric category that the metric belongs to. The system automatically populates this category if you create a new metric from the Metric Category form.</td>
</tr>
</tbody>
</table>

**Note:** You cannot change the category if the Depends on field is set or if another metric depends on this metric.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method</td>
<td>Determines how to use the metric.</td>
</tr>
<tr>
<td></td>
<td>• Assessment: Non-scripted metric. Make the metric available as a question on an assessment questionnaire. The Assessment method is compatible with all data types except Duration.</td>
</tr>
<tr>
<td></td>
<td>• Script: Scripted metric. Obtain values by writing a custom script. The Script method is compatible with the Duration, Number, and Percentage data types.</td>
</tr>
<tr>
<td></td>
<td>• Default answer from field: This option appears only if you have selected an Assessment Metric Type that contains a table. The General tab adds two fields:</td>
</tr>
<tr>
<td></td>
<td>• Default answer: Select the default answer for the question. The list comes from the selected table.</td>
</tr>
<tr>
<td></td>
<td>• Ask question: Specifies when to ask the question: always or only if the default answer is empty.</td>
</tr>
<tr>
<td></td>
<td>• Default answer from script: The General tab adds a field:</td>
</tr>
<tr>
<td></td>
<td>• Ask question: Specifies when to ask the question: always or only if the script does not contain a default answer. The script is defined on the Field Type tab.</td>
</tr>
<tr>
<td>Note:</td>
<td>If you select a Data type that is incompatible with the selected Method, the system automatically changes the Method to the correct value.</td>
</tr>
<tr>
<td>Weight</td>
<td>Numeric value that represents the importance of this metric relative to other metrics in the same category. By default, the weight is 10. For weighting suggestions, see Weight Metrics and Metric Categories.</td>
</tr>
<tr>
<td></td>
<td>This field is visible and required unless the Data type is Date, Date/Time, or String. These data types are not included in results calculations.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| Order  | Numeric value that determines the order of the metric question on assessment questionnaires, relative to other metric questions in the same category. The metric with the smallest order value appears as the first question in the category section. By default, the order is 100. For more information about questionnaire layout, see *Complete Assessment Questionnaires.*  
**Note:** It does not matter which order value you use for metrics with the Script method, as they do not appear on questionnaires. |
| Active | Check box that determines whether this metric is used to gather assessment results. If a non-scripted metric (Assessment method) is inactive, the question does not appear on assessment questionnaires generated after the metric becomes inactive. If a scripted metric (Script method) is inactive, the script does not run. |
| Mandatory | Check box that makes the metric question mandatory (selected) or optional (cleared) on assessment questionnaires. Users cannot submit questionnaires until they provide valid responses to all mandatory questions, which display a red *field status indicator.*  
This field is visible only if the Method is Assessment, the Depends on field is empty, and the data type is not Checkbox. |
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allow not applicable</td>
<td>Check box that determines whether to include a Not Applicable answer option for this metric question on assessment questionnaires. Users can select Not Applicable if they do not have sufficient information to respond to a question or if a question does not apply to a particular assessable record. User responses of Not Applicable are excluded from results calculations. This field is visible only if the Method is Assessment and certain data types are selected.</td>
</tr>
</tbody>
</table>

Additional fields you can add by customizing the form

| Details             | Text field containing an HTML editor. Use this field to present important details about this metric to assessment recipients. Details can include formatted lists, images, videos, or links to external websites. |

General Section
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question</td>
<td>Text to use as the question on assessment questionnaires. Enter a clear, straightforward question that is easy to answer, such as How likely are you to recommend this vendor for the purchase of office supplies?</td>
</tr>
<tr>
<td>Description</td>
<td>Information about the metric and what it evaluates. If the Method is Assessment, include details that help users understand how to answer the question. This text appears as a hint when a user points to the question text on the questionnaire.</td>
</tr>
<tr>
<td>Depends on</td>
<td>Setting used to make this metric a conditional question. Select an existing metric question from the list, which displays Checkbox, Choice, Likert Scale, Template, and Yes/No metrics of the same category as this metric. Then, use the Displayed when field to set the conditions that display this metric question on questionnaires. The system prevents the creation of recursive dependencies between metrics. For example, if Metric A depends on Metric B, Metric B cannot depend on Metric A. This field is visible only if the Method is Assessment.</td>
</tr>
<tr>
<td>Displayed when</td>
<td>Answer options for the selected Depends on metric question that, when chosen on questionnaires, display this metric question. This field is visible and required only if the Depends on field is set.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Data type</td>
<td>[Required] Format of the expected response data. The function of the data type depends on the selected Method. If the method is Assessment, the data type determines how users answer the corresponding question on questionnaires. If the method is Script, the data type determines how the system calculates assessment results.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> If another metric depends on this metric, you cannot change the data type.</td>
</tr>
<tr>
<td>Randomize answers</td>
<td>Check box that determines whether to present the answer options for this metric question in a random order. The order of answer options can influence users, which creates biased results. Randomizing answer options can help prevent this bias.</td>
</tr>
<tr>
<td></td>
<td>This field is visible only if a data type that requires metric definitions is selected.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Randomizing answer options for certain questions can make those questions confusing for the person answering. In general, only randomize answer options that do not follow a logical order. For example, the following question is confusing when randomization is enabled:</td>
</tr>
<tr>
<td></td>
<td>![Image](This vendor is one of my top choices when I need to purchase office supplies. Strongly agree  Disagree  Agree  Neither agree nor disagree  Strongly disagree)</td>
</tr>
<tr>
<td>Template</td>
<td>Metric template to use for the metric question. A metric template is a set of predefined answer options.</td>
</tr>
<tr>
<td></td>
<td>This field is visible and required only if the Data type is Template.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> If another metric depends on this metric, you cannot change the template.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Dependent plugin</td>
<td>Plugin that contains the tables queried in the script. The system executes the metric script only if the plugin is active. The default available values are Asset Management, CMDB, Core, Cost Management, Procurement, and Software Asset Management. If the Method is Script, select a plugin. This field is visible only if the Method is Script.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> An administrator may need to add more choices of plugins to the field.</td>
</tr>
<tr>
<td>Scale definition</td>
<td>Setting that determines whether lesser or greater numerical values equate to a good score in assessment result calculations. Select Low if lesser numerical values are better, such as for a metric that measures the number of incidents for a vendor. Select High if greater numerical values are better, such as for a metric that measures user satisfaction on a scale of one to five. The default value is High.</td>
</tr>
<tr>
<td></td>
<td>This field is visible and required unless the Data type is Date, Date/Time, or String. The results for these data types are not included in results calculations.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> For information about how to set the scale definition for data types that do not require you to set a numerical value, see Data Types.</td>
</tr>
<tr>
<td>Min</td>
<td>Lowest numerical value to be used as an answer option on assessments or as a scaled value in a scripted metric. This field is visible and required only if certain data types are selected. If the data type is Choice or Likert Scale, this field is read-only and is set automatically based on the smallest metric definition Value.</td>
</tr>
</tbody>
</table>
### Field Description

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max</td>
<td>Highest numerical value to be used as an answer option or scaled value. This field is visible and required only if certain data types are selected. If the data type is Choice or Likert Scale, this field is read-only and is set automatically based on the largest metric definition Value.</td>
</tr>
<tr>
<td>Script</td>
<td>Script that obtains the desired system information. This field is visible and required only if the Method is Script.</td>
</tr>
<tr>
<td>Related List</td>
<td>Assessment Metric Definitions: Lists all metric definitions, which appear as answer options for questions on assessment questionnaires. Click New to create a new metric definition. This related list is available only if the Data type is Choice or Likert Scale.</td>
</tr>
</tbody>
</table>

4. Save the record.
   When you create a Choice or Likert Scale question, reopen the Assessment Metric form after you submit it to create a metric definition. If you distribute a questionnaire without creating the answers for questions with these data types, recipients are unable to answer the questions. If the questions are mandatory, the recipients are unable to submit their questionnaires.

### Create a metric definition

Metrics with Choice or Likert Scale data types must have metric definitions defined to represent answer options on questionnaires.

Role required: assessment_admin or admin

Each metric definition appears as one answer option for a question on an assessment questionnaire. For example, a metric for the question "How satisfied are you with the quality of this vendor?" has three metric definitions to create these answer options: Very satisfied, Somewhat satisfied, and Not at all satisfied.

1. Open the metric record you want to edit.
2. In the Assessment Metric Definitions related list, click New to create a new metric definition.
3. Fill in the fields:
   - Display: Enter the text you want to appear as the answer option.
   - Value: Enter the numeric value, greater than or equal to zero, to which the answer option equates. Values are used to calculate metric results. When you view assessment questions, metric definitions appear in order from least to greatest value.
     - The system sets the minimum and maximum values according to the metric definition values.
     - To prevent reporting confusion, no two metric definitions for a given metric should have the same Value.
4. Click Submit.
Change the order of an answer

By default, the order of answer options is established when a question is created with a data type of Choice or Likert Scale.

Role required: assessment_admin or admin

The system creates an Order value for each choice based on where it appears in the original list when you submit it. This order corresponds to the Value setting you give the answer. The choice with the lowest order number appears first, and the choice with the highest order number appears last. If you want to reconfigure the order of the answer options, you must do so by editing the Order field and not the Value field.

The Order column is hidden in the base system.

To edit these records, configure the Assessment Metric Definitions related list in the question record to show the Order column, and then edit the order number in the list. The Value setting remain the same for each answer option after reorganization.

Metric types and assessable records

In the Assessments application, assessment administrators create and administer metric types and assessable records.

A metric type defines a set of records an organization wants to evaluate, such as vendors, projects, or employees. For each type, the system generates unique assessable records that link the type to records that need to be evaluated, such as the individual records for the vendors Amazon and Intel. There may be multiple assessable records for the same source record if the source record meets the criteria for more than one type. For example, you might want to evaluate a record on the Company table, such as Intel, as a vendor and as a manufacturer, with different categories and metrics.

For configuration suggestions, see Assessment administrator tasks on page 2259.

Assessable records

An assessable record links a source record you want to evaluate, such as the company record for Amazon or the user record for a sales representative, to a metric type, such as vendors or employees.

You use assessments to evaluate the assessable record. The system generates assessable records from the source records that match the table and conditions set on the Assessment Metric Type form. You evaluate the assessable records with metric categories and metrics, which define traits and values to assess. For metric types with the On demand schedule type, you can generate on-demand assessments from the Assessable Record form. This method of assessment generation makes it easy to create and preview short questionnaires or to quickly obtain assessment results for specific assessable records.
You can set up an assessment description that includes information from multiple fields on an assessable record and is displayed on multiple lines. This setup provides the user who is taking the assessment with a more detailed and understandable description of the information being requested on the assessment questionnaire. Create a multi-line description using table titles, which can be defined to use one or more fields from the selected table. See Define a new smartphone table title for more information.

Create metric types and generate assessable records
Each metric type sets a table and filter conditions that define a set of records to evaluate.

Role required: assessment_admin or admin

For example, the Vendor Performance application provides the Vendor metric type, which defines an assessable record for each source record in the Company [core_company] table that has the Vendor field selected. Create a metric type for each set of records you want to evaluate, such as vendors, users within an organization, or projects.

In addition to defining assessable records, metric types also determine how to filter decision matrix data and set the schedule type, which determines whether assessments are on-demand or scheduled.

1. Navigate to Assessments Metric Definition Types.
2. Click New.
3. Fill in the fields, as appropriate (see table).
4. When you are satisfied with the type settings, click Generate Assessable Records to save the record and create assessable records. The page redirects to the list of assessable records created.

You must click Generate Assessable Records to create the initial set of assessable records based on the table and conditions specified on the type record. After that, the system creates an assessable record each time a new matching record is created. Generate Assessable Records is located under Related Links.

**Note:** Clicking Generate Assessable Records can trigger the deletion of existing assessable records under certain circumstances. For more information, see Enforce a condition to delete an assessable record on page 2301.

**Table 1019: Metric types**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>[Required] Name of the type. It may be practical to give the type a name that indicates which records it defines.</td>
</tr>
<tr>
<td>Assessment duration</td>
<td>Amount of time assessors have to complete their assigned questionnaires, starting from the time the assessment is generated. The assessment duration sets the Due date that appears on assessment instances. Changes made to the duration of an attestation in the GRC Control Test Definition form are updated dynamically in this field. The default duration is 14 days.</td>
</tr>
<tr>
<td>Live feed</td>
<td>Check box that determines whether to enable (selected) or disable (cleared) the Live Feed view in scorecards for all assessable records created from this type.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Notify manager if overdue</td>
<td>Check box that determines whether to send (selected) email notifications a user's manager when that user fails to submit an assigned questionnaire on time.</td>
</tr>
<tr>
<td>Assessment manager</td>
<td>Manager for this assessment metric type. These users are responsible only for managing the assessment process and not the results. The system notifies the assessment manager when an assessment for this metric type is past due.</td>
</tr>
<tr>
<td>Scoring type</td>
<td>Scoring method to use for questions with a data type of attestation. The possible selections are:</td>
</tr>
<tr>
<td></td>
<td>• Percent: Attestation score as a weighted percentage of correct answers for scored questions. When you select this scoring type, categories can be scored as Percent or All or nothing.</td>
</tr>
<tr>
<td></td>
<td>• All or nothing: Requires all answers for attestation type questions to be correct, or the score is zero for the entire attestation. When you select this scoring type, all categories are scored automatically as All or nothing.</td>
</tr>
<tr>
<td>Scale factor</td>
<td>[Required] Number to represent the best possible score for assessment results. All results for assessments of this type are scaled to this number. 10 is generally a good scale factor.</td>
</tr>
</tbody>
</table>

**Note:** This field becomes read-only when it contains a value and you save the metric type. Choose a scale factor you are satisfied with before you save the metric type.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pagination setting for Service Portal view</td>
<td>Specify how the user will see pages on the desktop or tablet view in Service Portal.</td>
</tr>
<tr>
<td></td>
<td>• Category: Display each category on a separate page. The categories appear in the following order:</td>
</tr>
<tr>
<td></td>
<td>• Each category appears in sequence on a separate page for the first assessable record</td>
</tr>
<tr>
<td></td>
<td>• Then each category appears in sequence on a separate page for the next assessable record</td>
</tr>
<tr>
<td></td>
<td>• and so on</td>
</tr>
<tr>
<td></td>
<td>• Question: Display each question on a separate page. Questions appear on separate pages for mobile devices regardless of this setting. Each question appears for each category as described for the Category setting.</td>
</tr>
<tr>
<td></td>
<td>• None: All items on a single page—no pagination</td>
</tr>
</tbody>
</table>

Default: Category

**Note:** This field appears only when Service Portal is installed.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roles</td>
<td>Additional user roles that can view the results and access records associated with this type. Users with the specified roles have read access to this type record as well as to associated categories, metrics, assessable records and scorecards, category users, stakeholders, and decision matrixes.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Users with these roles do not have access to Assessments modules unless they are also assessment administrators. Users with these roles can navigate to the records by other means, such as from reference fields on assessment instances. This field provides the option to easily grant certain users access to specific assessment data in special cases. For example, the Vendor metric type provides access to users with the vendor_manager role so they can view results and compare assessable records when they open scorecards or decision matrixes in the Vendor Performance application.</td>
</tr>
<tr>
<td>Signature</td>
<td>[Optional] Acknowledgement by a survey recipient of requirements, admonitions, or expectations related to an assessment. For more information, see Create an assessment signature on page 2299.</td>
</tr>
<tr>
<td>Return URL</td>
<td>Destination address of a web page that is presented to users after they submit an assessment for this metric type. When a return URL is configured, the end note content does not appear.</td>
</tr>
<tr>
<td>State</td>
<td>[Read-Only] Status of the assessment: Draft or Published.</td>
</tr>
<tr>
<td>Business rule</td>
<td>[Admin only] Business rule the system creates to monitor the specified table. When a new record is added to the table that meets the metric type conditions, the business rule generates a corresponding assessable record.</td>
</tr>
<tr>
<td></td>
<td>If someone changes the table or conditions of the metric type, the system updates the business rule to reflect the changes. Existing assessable records associated with the metric type are not affected.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------</td>
</tr>
<tr>
<td><strong>Schedule type</strong></td>
<td>Setting that determines which assessment process to use. Select On demand or Scheduled.</td>
</tr>
<tr>
<td><strong>Scheduled job</strong></td>
<td>[Admin only] Scheduled job the system creates to generate assessments for this metric type. This field is populated the first time you save the record. The scheduled job name follows the format <code>&lt;type name&gt; Assessment Creation</code>. Administrators can configure a recurring assessment generation schedule for the metric type. This field is visible only when the schedule type is Scheduled.</td>
</tr>
</tbody>
</table>
| **Evaluation method** | [Admin only] Indicates the evaluation method for this metric type. The system sets this field based on how the metric type is created. The possible evaluation methods are:  
  • Assessment: Default filter value for metric types. Only this evaluation method uses assessable records, conditions, and stakeholders.  
  • Attestation: For details, see [Attestation](https:// servicenow.com).  
  • Survey: For details, see [Survey definitions](https:// servicenow.com) on page 2495. |
| **Scale factor**    | [Required] Number to represent the best possible score for assessment results. All results for assessments of this type are scaled to this number. 10 is generally a good scale factor. |

**Note:** If you change the schedule type from Scheduled to On demand, the system deletes the scheduled job. If you change the schedule type back to Scheduled, the system creates a new scheduled job. The previous assessment generation schedule is not saved, but can be reconfigured if desired.  

**Note:** This field becomes read-only when it contains a value and you save the metric type. Choose a scale factor that you are satisfied with before you save the metric type.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allow retake</td>
<td>Check box that allows users to modify their answers to a completed assessment, quiz, survey, or attestation. After the due date, the system removes the assessment from the user's My Assessments and Surveys page.</td>
</tr>
<tr>
<td>Active</td>
<td>Check box that determines whether the metric type is active. When the metric type is inactive (cleared), assessment generation is disabled and users cannot take existing assessments.</td>
</tr>
<tr>
<td>Description</td>
<td>Helpful information about this type. Enter a clear description of the type and its purpose.</td>
</tr>
<tr>
<td>Introduction</td>
<td>Introductory content to display on assessment questionnaires. Consider adding a company logo, a welcome message, background information about the survey, or instructions. You may need to configure the form to see this field.</td>
</tr>
<tr>
<td>End note</td>
<td>Content to display on the screen that appears when someone submits an assessment questionnaire. Consider adding a thank you message, followup instructions, or other applicable information. You may need to configure the form to see this field. End notes are not displayed if a Return URL is specified.</td>
</tr>
<tr>
<td>Send notifications</td>
<td>Select the check box to send notifications for this assessment, survey, or attestation. You may need to configure the form to see this field.</td>
</tr>
<tr>
<td>Condition section</td>
<td></td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Table</td>
<td>[Required] Table that contains the records you want to evaluate. The system creates assessable records for records on this table that meet the conditions you specify, if any. The number of matching records appears as a link by the Condition field. The link dynamically updates if you change the table selection. Click the link to open the list of matching records in a new tab or window.</td>
</tr>
<tr>
<td><strong>Note:</strong></td>
<td>Additional roles are required to view the records on certain tables. If you select a table that you do not have access to, a warning message appears by the Condition field where the number of matching records would be. You cannot generate assessable records for tables you do not have sufficient roles for.</td>
</tr>
<tr>
<td>Enforce condition</td>
<td>Check box that determines what happens to assessable records when you change the selected table or conditions.</td>
</tr>
<tr>
<td>Condition</td>
<td>Condition builder that defines specific records to assess from the selected table. If you do not specify any conditions, the system creates assessable records for all records on the selected table. Click the refresh icon to update the adjacent record count.</td>
</tr>
<tr>
<td><strong>Note:</strong></td>
<td>If you change the table or conditions, you must click Generate Assessable Records to create new assessable records.</td>
</tr>
<tr>
<td>Decision Matrix section</td>
<td></td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Filter field</td>
<td>[Required] Field on the selected table that can be used to filter results on decision matrixes and scorecards. For example, if the selected table is Company[core_company] and you choose Vendor type as the filter field:</td>
</tr>
<tr>
<td></td>
<td>• When you view decision matrixes for this type, the decision matrix menu to filter plotted items lists vendor types: Applications, Hardware, Services, and Software.</td>
</tr>
<tr>
<td></td>
<td>• On scorecards for this type, the Averages view displays ratings by vendor type.</td>
</tr>
<tr>
<td>Filter condition</td>
<td>Condition builder that defines which records from the table are available as choices on the filter menu. For example, if the filter field is Vendor type and you create the filter condition [Name] [does not contain] [Hardware], only records with vendor types of Applications, Services, and Software are possible choices as decision matrix filters.</td>
</tr>
</tbody>
</table>
Delete a metric type

Deleting a metric type entails deleting many related records.

Role required: assessment_admin or admin

You must delete some of these records manually before deleting the type, while the system deletes others automatically with the type.

1. Delete the records associated with the type to delete:
   - Assessment results (metric and category results)
   - Assessment instance (questions and assessment instances, in that order)
   - Assessment groups

2. Delete the type.
   A confirmation dialog box appears and alerts you that certain records associated with the type will also be deleted.

3. Click OK to delete the type and these related records:
   - Scheduled job for assessment generation
   - Business rule for assessable record generation
   - Assessable records
   - Metric categories
   - Category users
   - Stakeholders
Export an assessment
You can share assessments between ServiceNow instances by exporting an assessment and then importing the assessment on another instance.

Role required: assessment_admin or admin

Note: Update sets are available in the Helsinki release and should be used to move data from one instance to another. For information about update sets, see System update sets.

Note: The system exports a single XML file that does not contain result data.

The XML file contains a metric type [asmt_metric_type] and the following records that are associated with the type:
- Assessable records [asmt_assessable_record]
- Metric categories [asmt_metric_category]
- Metrics [asmt_metric]
- Metric definitions [asmt_metric_definition]
- Category users [asmt_m2m_category_user]
- Stakeholders [asmt_m2m_stakeholder]
- Decision matrixes [asmt_decision_matrix], [asmt_m2m_xcategory_matrix], and [asmt_m2m_ycategory_matrix]

1. Navigate to Assessments Metric Definition Types.
2. Right-click the record and select Export Assessment.
3. Save the XML file.

Import an assessment
Share assessments between ServiceNow instances by importing a previously exported assessment.

Role required: admin

Note: Update sets are available in the Helsinki release and should be used to move data from one instance to another. For information about update sets, see System update sets.

1. Ensure that the target instance has assessments enabled.
2. Follow the procedure detailed in Import a Record as XML Data.

Use update sets for surveys and assessments
Use an update set to capture changes to surveys and assessments.

Role required: admin or survey_admin

When developing surveys and assessments, you can use an update set to capture the changes and move them from a development instance to a production instance. Once an update set is created and marked current, all of the updates to the following tables are recorded in the update set.

The following tables are now update set enabled and also extend the application file:
- Assessment Metric Templates [asmt_template]
- Assessment Template Definitions [asmt_template_definition]
Create an assessment signature

A signature on an assessment questionnaire contains assertions that can communicate directions, a legal statement, or any text that you want the recipient to consider.

Role required: assessment_admin or admin

You can require the recipient to select a check box or provide a full signature to acknowledge acceptance of the assertion before submitting the form. You can display assertions without requiring a signature. An assessment property called Require authentication for user signature allows you to require users to provide their user name and password when an assessment asks for a full name signature.

1. Navigate to Assessments Metric Definition Signatures.

All signatures in the system appear in this list.

2. Click New.

3. Complete and submit the form using the fields in the table.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Descriptive name for this signature</td>
</tr>
<tr>
<td>Signature type</td>
<td>Type of signature required. The selections are Checkbox, Full name, or Assertion only. If Assertion only is selected, no signature is required to submit the questionnaire. By default, the system requires user authentication for a full name entry.</td>
</tr>
<tr>
<td>Assertion</td>
<td>Text to present to recipients that requires acknowledgement.</td>
</tr>
</tbody>
</table>

Assessable records

An assessable record links a source record you want to evaluate, such as the company record for Amazon or the user record for a sales representative, to a metric type, such as vendors or employees.

You use assessments to evaluate the assessable record. The system generates assessable records from the source records that match the table and conditions set on the Assessment Metric Type form. You evaluate the assessable records with metric categories and metrics, which define traits and values to assess. For metric types with the On demand schedule type, you can generate on-demand assessments from the Assessable Record form. This method of assessment generation makes it easy to create and preview short questionnaires or to quickly obtain assessment results for specific assessable records.

You can set up an assessment description that includes information from multiple fields on an assessable record and is displayed on multiple lines. This provides the user who is taking the assessment with a more detailed and understandable description of the information being requested on the assessment questionnaire. Create a multi-line description using table titles, which can be defined to use one or more fields from the selected table. See Define a new smartphone table title for more information.

View an assessable record
View the Assessable Record form to edit preferences and perform various actions.
Role required: assessment_admin or admin
1. Navigate to Assessments Assessable Records.
2. Open a record from the list.
   By default, the list displays only assessable records with Active metric types.
3. On the Assessable Record form, edit fields and perform other actions as necessary (see table).

### Table 1021: Viewing Assessable Records

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>[Read-Only] Assessable record name based on the display value of the source record. The name appears on assessment questionnaires.</td>
</tr>
<tr>
<td>Source</td>
<td>[Read-Only] Source record the assessable record is linked to. The Source reflects the table name and source record display value. For example, if the Name field is the display value for the Company table, the assessable record for a company record named Amazon has the Source value Company: Amazon.</td>
</tr>
<tr>
<td>Live feed</td>
<td>Check box that, when selected, creates a live feed group for the assessable record, which appears on the scorecard. If you clear the check box after a live feed group has been created, the system deletes the live feed group and all its messages.</td>
</tr>
<tr>
<td>Type</td>
<td>[Read-Only] Metric type from which the assessable record was generated.</td>
</tr>
<tr>
<td>Decision matrix</td>
<td>Check box that, when selected, enables this assessable record's results data to appear on decision matrixes of the same metric type. Decision matrixes are graphs that plot the assessment results for multiple assessable records. If you clear the check box, the assessable record still appears on the default decision matrixes if you click the View Matrix related link on the assessable record's scorecard.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Live feed group</td>
<td>[Read-Only] Live feed group for this assessable record. When you select the Live feed check box and save the record, the system populates this field.</td>
</tr>
</tbody>
</table>

### Related Links

- **View Scorecard**: Opens the scorecard for the assessable record.

### Related Lists

<table>
<thead>
<tr>
<th>Category</th>
<th>All metric categories associated with the assessable record. An assessable record must be associated to a category to be evaluated. Click Edit to add or remove category associations. Note that it is often more efficient to associate assessable records to categories using theMetric Category form.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category users</td>
<td>All stakeholders who can take assessment questionnaires about this assessable record. Click Edit to create and delete stakeholders. For more information about this and other methods of creating stakeholders, see Stakeholders. This related list is available only when the associated metric type has the Scheduled schedule type.</td>
</tr>
</tbody>
</table>

---

**Enforce a condition to delete an assessable record**

By default, the system does not delete assessable records, even if you change the table or conditions for the type and the existing assessable records no longer match.

Role required: assessment_admin or admin

The system can be configured so you can trigger the deletion of assessable records that do not match the type table and conditions.

1. **On the Assessment Metric Type form**, select the Enforce condition check box to enable deletion of existing assessable records of this type that do not match the table or conditions specified.

   When the check box is cleared, the system retains existing assessable records of this type, even if they do not match the table and conditions specified.

2. **Click Generate Assessable Records** to delete all assessable records associated with the type that do not match the current table and conditions.

   The system does not automatically delete assessable records, even if the Enforce condition check box is selected. You must click Generate Assessable Records with the check box selected every time you want the system to delete non-matching assessable records.

---

**Delete an assessable record**

When you delete an assessable record, the system deletes any stakeholders for the record.

Role required: assessment_admin or admin
**Note:** If a source record is deleted, the system deletes the associated assessable record. To delete the source record, you must first delete all associated metric results and category results.

Delete the assessable record:
- To delete a single record, open the record and click Delete.
- To delete multiple records, use the Assessable Records list.

**Copy an assessment**

Create a copy of an assessment with at least one category. All associated questions (type), configurations, categories, metrics, domain separation rules, and role-based categories are copied. Assigned users, category users, instances, and trigger conditions are not copied.

Role required: assessment_admin or admin

1. Navigate to Assessments Metric Definition Types.
2. Select an assessment metric type.
3. Click Copy on the title bar or select Copy from the context menu on the title bar.

**Create a metric template**

Create a metric template to define reusable rating scales for evaluating non-scripted metrics.

Role required: assessment_admin or admin

1. Navigate to Assessments Metric Definition Templates.
2. Click New.
3. Fill in the Name field on the Assessment Metric Template form.
4. To use images for template choices, such as for image scale questions, select Allow Image.
5. Click Submit.
6. Under the Assessment Template Definitions related list, click New.
   Create a template definition for each answer option you want to appear on an assessment question.
7. Fill in the following fields:
   - Display: Enter the text to appear as the answer option.
   - Value: Enter a numeric value, equal to or greater than zero, that you want the answer option to equate to. Values are used in results calculations.
   - Selected Image: Click to add the image to use for selected state.
   - Unselected Image: Click to add the image to use for unselected state.

When you view assessment questions that use templates, answer options appear in order from least to greatest Value.

---

**Tip:** To prevent reporting confusion, no two template definitions for a given template should have the same Value.

8. Click Update.

**Metric templates**

Metric templates define reusable rating scales for evaluating non-scripted metrics.

Each answer option on the scale is defined as a template definition, much like a metric definition. For example, the metric template named Satisfaction contains the template definitions: Very Satisfied, Satisfied, Neutral, Dissatisfied, and Very Dissatisfied.
Metric templates are available for metrics that have Template as the Data type. The following metric templates are available by default.

<table>
<thead>
<tr>
<th>Name</th>
<th>Assessment template definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likert 5</td>
<td>Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>Very Dissatisfied, Dissatisfied, Neutral, Satisfied, Very Satisfied</td>
</tr>
<tr>
<td>Frequency</td>
<td>Never, Seldom, Sometimes, Most of the time, All of the time</td>
</tr>
<tr>
<td>Amount</td>
<td>None, Few or little, Average amount, Many, Quite a lot</td>
</tr>
<tr>
<td>Size</td>
<td>Very Small, Small, Average, Large, Very Large</td>
</tr>
<tr>
<td>Quality</td>
<td>Very Poor, Poor, Average, Good, Very Good</td>
</tr>
<tr>
<td>Complexity</td>
<td>Very Complex, Complex, Moderate, Simple, Very Simple</td>
</tr>
</tbody>
</table>

*Update a metric minimum and maximum value to match a template*

For assessment results to be properly calculated, the Min and Max values of a metric that uses a template must be equal to the smallest and largest template definition Value, respectively.

Role required: assessment_admin or admin

The system sets the Min and Max fields automatically when you create a metric of the Template data type, based on the template definition values. However, the system does not update these fields for existing metrics if you add a new template definition to a template or if you update the Value of an existing template definition. If the new Value is less than the minimum value of any metrics that use the template or greater than the maximum value, update the metrics accordingly.

To edit the minimum and maximum values for a question that has the Template data type:

1. Navigate to Assessments Metric Definition Metrics.
2. Configure the list to show the Min and Max columns.
3. Run the following list filter condition: [Template] [is] [<select the template you updated>]
4. Ensure the Min and Max values match the smallest and largest template definition Value for the selected template, respectively.

   If the values do not match, edit the Min and Max directly from the list.

   **Note:** When the data type is Template, a UI policy prevents the editing of Min and Max from the form.

*Category users and stakeholders*

Users who take assessments are individuals in your organization who have specific knowledge of the assessment categories and the records being assessed. A person who is qualified to answer assessment questions from metrics in a specific category becomes a category user when associated to that category. A category user then becomes a stakeholder when associated to a specific assessable record.
The system determines which assessable records and questions a user receives by looking at the metric categories and assessable records for which those users are stakeholders. Assessment administrators can create and manage category users and stakeholders.

**Note:** Category users and stakeholders are used only for scheduled assessments.

### Category users

Category users are users who can potentially answer assessment questions about a particular metric category for scheduled assessments. Category users should have special knowledge of the categories and the metrics those categories contain. A category user becomes a stakeholder when associated to an assessable record. Create at least one category user for each category you want to use for assessment questionnaires. There is no need for category users if the category contains only scripted metrics.

### Stakeholders

A stakeholder is a category user with specific product or service knowledge, who is associated to an assessable record. A stakeholder is familiar with the assessable record and all the metrics within a specific category. The same category user can be associated to multiple assessable records, in which case the system creates a stakeholder record for each association.

There are multiple ways to create stakeholders:

- Configure the system to create stakeholders automatically.
- Associate multiple category users to multiple assessable records.
- Associate multiple category users to one assessable record.
- Associate one category user to one assessable record.

**Note:** Ensure you establish the desired user and assessable record associations to categories before attempting to creating stakeholders.

### Create a category user

Create category users by associating users in the system to metric categories.

Role required: assessment_admin or admin

When you create category users, choose users who are knowledgeable and can answer questions from that category. For example, a purchasing agent is a good category user for metrics that evaluate a vendor’s discount practices.

1. Navigate to Assessments Metric Definitions Categories.
2. Open a category record.

**Note:** The category must be associated to a metric type that has the Schedule type set to Scheduled.

3. In the Users related list, click Edit.
4. Select the appropriate users for this category.

### Create stakeholders automatically

You can configure the system to create stakeholders automatically from all category users and assessable records associated with a category using the Create stakeholders check box on the Metric Category form.

Role required: assessment_admin or admin
If you associate a user to the category, the system makes the resulting category user a stakeholder for all the assessable records associated to the category. Similarly, if you associate a new assessable record to the category, the system makes all category users stakeholders for that record if they are not already stakeholders.

**Note:** Use the Create stakeholders check box with caution. You can end up with more stakeholders than you want and a large amount of unnecessary assessment data. Automatic stakeholder creation is best suited to assessment implementations in which category users are knowledgeable about all or most of the assessable records associated to each category.

1. Navigate to Assessments Metric Definition Categories.
2. Select a category.
3. Associate category users and assessable records to the category.
4. Select the Create stakeholders check box.
5. Click Update.
   All the category users are associated to all the assessable records as stakeholders.
6. In the Assessable Records related list, click Edit.
7. Using the slushbucket, associate an assessable record to the category.
8. Click Save.
   The system makes all category users stakeholders for the new assessable record.
9. Delete stakeholders as needed.

Associate multiple category users to multiple assessable records
The stakeholder list helper in the create stakeholders module is the most efficient way to associate multiple category users to multiple assessable records in a single interface.

Role required: assessment_admin or admin

You can select category users from one category at a time.

Note: You cannot edit or delete stakeholders using the list helper.

1. Navigate to Assessments Advanced Create Stakeholders.
The stakeholder list helper appears.
2. Select a metric type from the list of available types.

**Note:** Only metric types for scheduled assessments are available. On-demand assessments do not use category users or stakeholders.

3. Select a category from the list of available categories.

**Note:** Only categories within the selected metric type are available.

The system populates the Category User and Assessable Records lists with category users and assessable records associated to the selected category.

4. Select one or more category users from the Category Users list.
5. Select one or more assessable records from the Assessable Records list.
6. Click the Associate arrow between the lists to complete the association.

A message above the list helper advises you that the selected category users are now stakeholders for the selected assessable records.

Delete a stakeholder for multiple assessable records
You can delete stakeholders for multiple assessable records.

Role required: assessment_admin or admin

1. Navigate to Assessments Advanced Assessment Stakeholders.
2. Sort the list by Assessable Record or Category User depending on the perspective you want.
3. Select the check box for each stakeholder you want to delete.
4. Select Delete in the Actions choice list.
5. Click OK to confirm the action.

The system deletes the stakeholders.
**Associate one category user to one assessable record**

You can create a single stakeholder using the list in the Assessment Stakeholders module.

Role required: assessment_admin or admin

Associate any category user to any assessable record.

1. Navigate to Assessments Advanced Assessment Stakeholders.
2. Click New. On the Assessment Stakeholders form, fill in these fields:
   - Category user: Select a category user.
   - Assessable record: Select an assessable record.
3. Click Submit.
   The selected category user becomes a stakeholder for the selected assessable record. To verify the association, navigate to the assessable record and note that the selected category user is on the Category users related list.

**Note:** Do not create stakeholders from category users and assessable records of different metric types.

**Associate multiple category users to one assessable record**

You can create many stakeholders for a single assessable record from the Assessable Record form.

Role required: assessment_admin or admin

You can also edit or delete stakeholders from the form.

1. Navigate to Assessments Assessable Records.
2. Open a record from the list.
3. In the Category users related list, click Edit.
   These category users are the stakeholders for this assessable record.
4. Use the slushbucket to edit the category users associated to this assessable record. Add category users to create stakeholders. Remove category users to delete stakeholders. The system only shows category users for categories associated to the assessable record. For example, if an assessable record is only associated to the Compliance Score and Support Rating categories, you do not see User Satisfaction category users.

Delete a stakeholder for one assessable record
You can delete stakeholders for one assessable record.

Role required: assessment_admin or admin

1. Navigate to Assessments Assessable Records.
2. Open an assessable record.
3. In the Category Users related list, select the check box for each stakeholder you want to delete.
4. Select Delete in the Actions choice list.
5. Click OK to confirm the action.
The system deletes the stakeholders.

Generate an on-demand assessment

Use on-demand assessments to familiarize yourself with the basic assessment process and test your questionnaires using minimal configuration.

Role required: assessment_admin or admin

Select the assessable records to evaluate, create the categories and questions, and then assign an assessment to a user in the system. Pre-configured stakeholders are not used for on-demand assessments.

1. Create a metric type and set the Schedule type to On demand to allow for testing of your assessment configuration.
2. Generate the assessable records for the metric type you created.
3. Create the metric categories required to evaluate the assessable records selected.
4. Create one or more assessment questions, or metrics, for each category.
5. Publish the assessment.
6. Perform an on-demand assessment to test your categories and metrics.
7. Analyze the assessment ratings in an assessment scorecard or decision matrix.

On-demand assessments

On-demand assessments can be generated for metric types with the Schedule type field set to On demand.

For the system to properly generate on-demand assessments, the metric type must be active and published. The metric type must also be associated to at least one metric category. That metric category must be associated to one or more of each of the following items:

- Assessable record
- Metric

By default, an assessment administrator can generate an on-demand assessment for one assessable record or multiple assessable records.

Generate an on-demand assessment for one assessable record

When you generate an on-demand assessment from the Assessable Record form, the resulting assessment contains questions from the categories associated to the assessable record.

Role required: assessment_admin or admin

1. Navigate to Assessments Assessable Records.
2. Open an assessable record associated to a metric type that has the On demand schedule type.
3. On the Assessable Record form, click Assign Assessment.
The Select Assessor dialog box appears.
4. Select a user from the Recent Assessors list or select a different user.
5. Click OK.

The system generates an assessment instance assigned to the selected user.

Generate an on-demand assessment for multiple assessable records
When you generate an on-demand assessment from the Assessment Metric Type form, the resulting assessment contains questions from all categories associated to any assessable records for the metric type.

Role required: assessment_admin or admin

For example, if there are 15 assessable records associated to at least one category with assessment metrics, the assessment contains questions for all 15 assessable records.

1. Navigate to Assessments Metric Definition Types.
2. Open a metric type that has the On demand schedule type.
3. On the Assessment Metric Type form, click Assign Assessment.

The Select Assessor dialog box appears.
4. Select a user from the Recent Assessors list or select a different user.
5. Click OK.

The system generates an assessment instance assigned to the selected user.

Generate an assessment with the on-demand API
The Assign Assessment buttons call an API to generate on-demand assessments.

Role required: assessment_admin or admin

1. To generate an assessment, call the from any script in the system, such as a business rule or client script.
2. Use the sys_ids of these items:
   • An assessable record to evaluate. The assessable record must be associated with an on-demand type and at least one category that contains non-scripted metrics.
   • One or more users who should perform the assessment. The API generates a questionnaire about the specified assessable record for each user.
Schedule an assessment

After you have evaluated your questionnaires using on-demand assessments, edit your categories and metrics as needed, reset your metric type record, and select the users who are qualified to evaluate the assessable records.

Role required: assessment_admin or admin

1. Open the metric type you created for the on-demand assessment and set the Schedule type to Scheduled.
2. Make sure the categories and metrics you created for the on-demand assessment are correct.
3. Create category users who have special knowledge of your categories.
4. Create stakeholders by associating category users to specific assessable records.
5. Set a schedule for automatic assessment generation or generate the assessment manually. This procedure must be done by a system administrator.
6. Configure email notifications to remind users of their assigned assessments and to report to managers when an employee misses an assessment deadline.
7. Analyze the assessment ratings in an assessment scorecard or decision matrix.

Schedule types
You can schedule assessments for preconfigured users or send them to any user on demand.

On-demand assessments require less setup. Scheduled assessments define users, or stakeholders, who have specific knowledge of the records being evaluated, and automatically send out assessment questionnaires to those users at scheduled intervals. The best practice is to configure an on-demand assessment first to familiarize yourself with the process and test your questionnaires. When you are satisfied with your categories and questions, reconfigure for a scheduled assessment. These configuration paths are the easiest for both assessment types. Refer to Key Terms for definitions of the terms used in these procedures.

Set an assessment generation schedule
You can set assessment generation schedules. You must set a schedule for each metric type individually.

Role required: assessment_admin or admin

1. Navigate to Assessments Metric Definition Types.
2. Open the appropriate metric type record.
3. Click the reference icon next to the Scheduled job field to open the Schedule Item record.
4. Locate the Trigger type field and set a recurring schedule for the scheduled job.

   For example, if you want to generate assessment components each month, select the Interval or Repeat trigger type and specify a Repeat value of 30 days. Alternatively, select Day in Month and specify a Run time and Run day of month.

   The optimal frequency of assessment generation is subjective. When you set the schedule, keep in mind the number of records to evaluate, how often your organization requires updated assessment results, the time and effort required of users to complete assessments, and other relevant factors.

Publish a metric type
Before it is possible to generate assessments, an assessment administrator must publish the associated metric type.

Role required: assessment_admin or admin

The State field on the Assessment Metric Type form indicates whether the type is published. The default state is Draft, which disables the system from generating assessments.

1. Navigate to Assessments Metric Definition Types.
2. Open a metric type record, and click Publish. 
   The Publish button is available only if the state is Draft and there is at least one metric associated with 
   the type. 

   **Note:** A metric type cannot be moved back to the Draft state after it has been published. 

**Scheduled assessments**

The system generates a unique scheduled job for each metric type with the Schedule type field set to 
Scheduled. Each scheduled job generates assessment components for the related metric type. By default, 
the scheduled job runs when an administrator executes it manually, but administrators can set a schedule 
to generate assessments automatically on a recurring basis. 

For the system to properly generate scheduled assessments, the metric type must be active and 
*published*. The metric type must also be associated to at least one metric category. That metric category 
must be associated to one or more of each of the following items: 

- **Assessable record** 
- **Stakeholder** associated to one of the assessable records 
- **Metric**

**Generate a scheduled assessment manually**

Administrators can generate scheduled assessments manually. 

Role required: assessment_admin or admin 

Use this option, for example, if you have set a schedule but want to generate assessments before the next 
scheduled run date. 

1. Navigate to Assessments Metric Definition Types. 
2. Open the appropriate metric type record. 
3. Click Generate Assessments to trigger the scheduled job immediately. 

   **Note:** Be careful to click Generate Assessments, not Generate Assessable Records. 

**Generate a vendor type assessment manually**

The Vendor Performance feature provides a direct method of generating assessments for the Vendor 
metric type. 

Role required: admin 

1. Navigate to Vendor Performance Admin Generate Assessments. 
2. Click Generate Assessments to execute the scheduled job for the Vendor type. 

**Clean up assessment data**

The assessment process generates a considerable amount of data, some of which is not useful after a 
short time. 

Role required: assessment_admin or admin 

The assessment process generates a considerable amount of data, some of which is not useful after a 
short time. Assessments include a scheduled job called Remove Old Assessment Data that is available to 
administrators only. The scheduled job removes these items if they are more than a year old: 

- Assessment instance questions 
- Assessment instances
• Metric results

By default, the scheduled job is executed manually. Administrators can configure the scheduled job to run automatically on a recurring schedule.

1. Navigate to System Scheduler Scheduled Jobs Scheduled Jobs.
2. Open the Remove Old Assessment Data record.
3. On the Schedule Item form, set the Trigger type field to run the scheduled job on a recurring schedule.
   It is recommended to set the scheduled job to run on a weekly or monthly basis.
4. Click Execute Now to run the scheduled job.

Assessment instances
An assessment instance represents one occurrence of a questionnaire assigned to one user.

The system generates assessment instances only when the required conditions are met, as described in Scheduled assessments and On-demand assessments, and there are non-scripted metrics in at least one category.

When the system generates scheduled assessments for a metric type, each assessment instance contains questions about assessable records and categories related to the stakeholder to which it is assigned.

Example:
Recall that there can be multiple stakeholder records associated with one user record. Minh Leclare is a stakeholder for these items related to the Vendor metric type:

<table>
<thead>
<tr>
<th>Assessable record</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amazon</td>
<td>User Satisfaction</td>
</tr>
<tr>
<td>Acme</td>
<td>User Satisfaction</td>
</tr>
<tr>
<td>Acme</td>
<td>Reliability</td>
</tr>
<tr>
<td>Cisco</td>
<td>Reliability</td>
</tr>
</tbody>
</table>

When the system generates a scheduled assessment, Minh is assigned one assessment instance. Minh must evaluate Amazon, Acme, and Cisco by answering questions from the categories for which she is a stakeholder. Assuming that there are three questions in the User Satisfaction category and six questions in Reliability, Minh’s questionnaire contains three questions about Amazon, nine questions about Acme, and six questions about Cisco.

When the system generates an on-demand assessment for a specific assessable record, the assessment instance contains questions about that assessable record and all its associated categories. When the system generates an on-demand assessment for a metric type, the assessment instance contains questions about all that metric type’s assessable records and their associated categories.

View an assessment instance
An assessment instance represents one occurrence of a questionnaire assigned to one user.

Role required: admin, survey_admin, or assessment_admin

1. Navigate to Assessments Assessment Instances. The following sub-modules are available based on the state of the instances:
   • Ready to take: Displays assessment instances that are ready to be taken by the user. By default, these instances are sorted in ascending order by the Number field.
• In progress: Displays assessment instances that are in progress. By default, these instances are sorted in ascending order by the Number field.
• Completed: Displays assessment instances that are complete. By default, these instances are sorted in descending order by the Taken on field.
• Cancelled: Displays assessment instances that are cancelled. By default, these instances are sorted in ascending order by the Number field.
• All: Displays assessment instances in all states. By default, these instances are sorted in ascending order by the Number field.

2. Click an assessment instance number to open the record from the required sub-module. By default, the following fields are displayed in the Assessment Instance form for all sub-modules other than Completed.

**Note:** When you open an instance in the Completed sub-module, you are redirected to the User's Response page.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Auto-generated record number.</td>
</tr>
<tr>
<td>Metric type</td>
<td>Metric type of this assessment.</td>
</tr>
<tr>
<td>Assessment group</td>
<td>Assessment group to which this assessment belongs.</td>
</tr>
<tr>
<td>Due date</td>
<td>Date by which the assessment instance must be completed. The system populates the due date from the value in the metric type Assessment duration field. The system generates email notifications related to the due date. <strong>Note:</strong> By default, the system runs the Cancel Expired Assessments script every 30 days to cancel expired survey, assessment, and quiz instances that are in the Work in progress or Ready to take states.</td>
</tr>
<tr>
<td>State</td>
<td>State of the assessment.</td>
</tr>
<tr>
<td>Domain</td>
<td>Domain associated with the instance.</td>
</tr>
<tr>
<td>Assigned to</td>
<td>User this assessment is assigned to. This field becomes read-only when the state is In progress, Complete, or Canceled.</td>
</tr>
<tr>
<td>Signature</td>
<td>Name of the signature record attached to this assessment. A signature requires that assessment recipients acknowledge that they have read any assertions attached to a questionnaire.</td>
</tr>
</tbody>
</table>
3. Click Take assessment to open the questionnaire.

This button is available if all the following conditions are true for the assessment instance:

- It is Assigned to you.
- The State is Ready to take or In progress.
- The associated metric type is Active.

Configure trigger conditions for an assessment

Trigger conditions specify when to send a particular assessment and who to send the assessment to.

Role required: assessment_admin or admin

1. Navigate to Assessments Admin Trigger Conditions.
2. Complete the fields as described in the table:

Table 1024: Trigger Condition form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment</td>
<td>[Required] Metric type to generate assessment instances for. Triggered assessments only work if the metric type is set to the On demand schedule type.</td>
</tr>
<tr>
<td>Table</td>
<td>[Required] Table to run the trigger condition on. You can select only tables in the current application scope. The table must have a connection to the assessable records for the selected Assessment. For example, you might want to send a vendor assessment when incidents close that are related to vendors you assess. In this case, select the Incident [incident] table. After you select a table, ensure there is at least one option for the Assessable Record Field. If there is not, select a different table.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>User field</td>
<td>[Required] Field that stores the users you want to send the assessment. You can select any field, on the selected Table or on a related table, that references the User [sys_user] table. Use the tree picker to select a field.</td>
</tr>
<tr>
<td>Repeat Interval</td>
<td>Minimum period that must pass before the trigger condition can resend the assessment to the same user. For example, assume the repeat interval is set to 30 days. Even if the same user is eligible for multiple assessments from this trigger condition, the system can only send the user one assessment every 30 days.</td>
</tr>
<tr>
<td>Active</td>
<td>Check box that determines whether this trigger condition is active (selected).</td>
</tr>
<tr>
<td>Business rule</td>
<td>[Admin only] Business rule the system creates to monitor the selected table. When the condition is met, the business rule sends the assessment to the correct user. No configuration is necessary for this business rule.</td>
</tr>
<tr>
<td>Trigger randomly</td>
<td>Check box that determines whether to send the assessment to the appropriate user every time the condition is met (cleared) or only a percentage of the time (selected), as specified in the Probability (%) field.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Probability (%)</td>
<td>Probability out of 100 that the assessment will be sent each time the condition is met. For example, if the probability is set to 50, the system sends the assessment approximately 50% of the time the conditions are met, assuming there are no repeat interval restrictions. This field is visible and required only when the Trigger randomly check box is selected.</td>
</tr>
<tr>
<td>Assessable Record Field</td>
<td>[Required] Field on the selected Table that determines which assessable record will be the subject of the assessment. Only appropriate reference fields on the selected Table are available to select. If there are no Assessable Record Field options available, you must select a different Table.</td>
</tr>
<tr>
<td></td>
<td>If the selected Assessment evaluates records on the Company [core_company] table and the selected Table is Incident, the only Assessable Record Field options are fields on the Incident table that reference the Company table. For example, Company or, if vendor ticketing is enabled, Vendor. If you select Vendor, the trigger condition sends an assessment about the Vendor for the incident, assuming there is an assessable record for the associated company. The assessment contains questions from all metric categories associated with the assessable record.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This field is not available if the selected Assessment is a metric type used for surveys. See <em>Survey trigger conditions</em> on page 2521.</td>
</tr>
<tr>
<td>Related Field 1 – Related Field 4</td>
<td>Field that contains a value you want to store for reporting purposes. You can pick any reference field on the selected Table. When the trigger condition generates an assessment instance, the system stores the value from the triggering record. Select up to four fields. For example, if you select the Incident table, you might select Caller and Vendor as related fields. That stores the caller and vendor associated with the incident as Related record 1 and Related record 2 in the assessment instance record. To view these fields, configure the Assessment Instance form.</td>
</tr>
</tbody>
</table>
Assessment trigger conditions
A trigger condition tells the system who to send a designated assessment to and when, based on specific conditions.

With trigger conditions, assessment administrators can configure the system to generate assessments each time a specific action occurs, such as when an incident or change request closes. The trigger condition sends the assessment to specified users who are related to the triggering record, such as incident callers or change request assignees. You can choose to send the assessment every time the condition is met, or set a probability for the system to send the assessment at random when the condition is met.

Table 1025: Trigger condition configuration

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Summary information to identify the trigger condition.</td>
</tr>
<tr>
<td>Condition</td>
<td>[Required] Condition builder that defines the criteria that must be true to send the assessment. For example, if you want to send an assessment whenever an incident closes, create the condition [State] [is] [Closed].</td>
</tr>
</tbody>
</table>

Trigger condition example

Modesto Scroggie is the caller on an incident that is assigned to Boris Catino, a service desk technician. Boris contacts a vendor to resolve Modesto’s issue and sets the Vendor field to Microsoft. When the incident closes, the system creates an assessment instance assigned to Boris so he can evaluate Microsoft as a vendor.

Because two related fields were selected as part of the trigger condition, the assessment instance stores the following information from the incident:

- Related record 1: User: Modesto Scroggie
- Related record 2: Company: Microsoft
Note: Even though the trigger condition is set to be triggered every time the conditions are met, the Repeat Interval setting ensures that Boris does not receive another assessment if another vendor incident assigned to him closes within 30 days of the first one.

Enable manager notifications

Users with the assessment_admin role can enable the Notify manager assessment is overdue email notification.

Role required: assessment_admin or admin

This notification sends emails to assessors’ managers when assessors do not complete their assigned assessments on time. For more information, see the table of assessment notifications. You must enable or disable this email notification separately for each metric type.

1. Navigate to Assessments Metric Definition Types.
2. Open a metric type.
3. Select the Notify if overdue check box.

To disable manager notifications, clear the check box.

4. Save the record.

Note: The assessor’s user record must have a manager specified in the Manager field to use this notification. You might need to configure the form to use this field.

Assessment notifications

You can configure the system to send email notifications for assessments.

You can configure any of the following types of notification during the process of generating assessable records:

• Notify assessment user: This messages notifies you of an assigned an assessment and includes the type, the due date, and basic instructions. The message also contains a link to the record where you take the assessment.

  Note: If a user has a pending assessment, then the system will not generate another instance of the same assessment.

• Remind assessment user: This message reminds you of the due date if half the time passes and you have not completed the assessment. The message content is the same as the first notification.

• Notify manager assessment is overdue: If you do not complete an assessment by the due date, the system may send a notification to your manager, depending on configuration.

  Note: By default, the system runs a script every 30 days to cancel expired assessment and survey instances that are in the Work in progress or Ready to take states.
Assessment notification workflow
The system sends assessment notifications according to the Notify assessment user workflow. Users with the workflow_admin, workflow_creator, or workflow_publisher roles can view workflows.

1. To open the graphical Workflow Editor, navigate to Workflow Workflow Editor.
2. In the activity menu, click the link to choose an existing workflow.

![Figure 425: Workflow Window](image)

3. Select Notify assessment user from the Workflow Versions list.
   The workflow appears.
View a metric result

Metric results contain values that represent an evaluated record's performance for a specific metric, based on a single evaluation from one user or from the execution of a script. Metric results contain actual values as well as calculated values. The system uses values from metric results to calculate category results.

Role required: assessment_admin or admin

If there is an active scripted metric when the assessment is generated, the system automatically produces a metric result for each associated assessable record. The system produces an additional metric result for each question a user answers on a completed assessment questionnaire. If multiple users complete questionnaires with the same questions on the same assessable records, the system produces metric results for each user's responses. For example, three users complete questionnaires that contain the same four questions about the Acme Corporation record. The system produces 12 metric results: one per user for each question.

1. Navigate to Assessments Results Metric Results.
2. Open the metric result record you want to view.
All fields on the form except Updated and String value are read-only.

### Table 1026: Metric Result form fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment group</td>
<td><em>Assessment group</em> to which the metric result is associated.</td>
</tr>
<tr>
<td>Metric</td>
<td>Name of the metric to which these metric result values apply.</td>
</tr>
<tr>
<td>Data type</td>
<td>Data type of the metric.</td>
</tr>
<tr>
<td>Method</td>
<td><em>method</em> of the metric.</td>
</tr>
<tr>
<td>Updated</td>
<td>Date and time the metric result was last updated.</td>
</tr>
<tr>
<td>Source</td>
<td>Source record of the assessable record evaluated.</td>
</tr>
<tr>
<td>Assigned to</td>
<td>User who completed the assessment questionnaire. This field is blank when the method is Script.</td>
</tr>
<tr>
<td>Instance</td>
<td><em>Assessment instance</em> completed by the Assigned to user. This field is blank when the method is Script.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Actual value    | Unscaled value from a user response or script, depending on the method:  
|                 | • Assessment: Value obtained from the user response to the assessment instance question. The actual value is determined by the metric data type:  
|                 | • Checkbox: The actual value is 0 if the check box is cleared and 1 if it is selected.  
|                 | • Choice or Likert Scale: The actual value is equal to the Value of the metric definition associated with the chosen answer option.  
|                 | • Date, Date/Time, or String: The actual value is -1 to indicate that these data types do not contribute to category result calculations.  
|                 | • Template: The actual value is equal to the Value of the template definition associated with the chosen answer option.  
|                 | • Yes/No: The actual value is 0 if the response is No and 1 if it is Yes.  
|                 | • Script: Value the script placed in the actual_result variable.  
|                 | This field is hidden and left blank when the data type is Duration.  
| Duration value  | Specific kind of actual value that is only applicable if the data type is Duration. The duration value is the value obtained by the script query from the actual_result parameter, such as the average duration of outages for a vendor.  

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<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
</table>
| Scaled value  | Appropriate value from the scaled_result variable in the associated metric script. The code in a scripted metric defines a scaling scheme for the actual values it obtains. For example, a scripted metric queries the CMDB to return the number of configuration items (CIs) for a vendor. The code includes this scaling scheme, where actual_result is the number of CIs, and scaled_result is a representation of the quantity of CIs:  
  
  ```java
  if (actual_result < 1)  
    scaled_result = 0;  
  else if (actual_result < 1000)  
    scaled_result = 1;  
  else if (actual_result < 10000)  
    scaled_result = 2;  
  else if (actual_result < 25000)  
    scaled_result = 3;  
  else if (actual_result < 100000)  
    scaled_result = 4;  
  else  
    scaled_result = 5;  
  ```
  
  If the script detects 315 CIs for the vendor, the Actual value is 315 and the Scaled value is 1 for this metric result.  
  
  **Note:** Although this field is visible only when the method is Script, the system populates the field with the Actual value when the method is Assessment, as the scaled value is used in the Normalized value calculation.  

| Normalized value | Adjusted value that accounts for weights, scale definition, minimum and maximum values, and other factors that impact the metric (like the survey responses or the input value—the actual value given by the user). See the example for Normalized value in View an assessment category result on page 2387. |

| String value | Value that displays the response as it appears on a questionnaire. In some cases this is the same as the Actual value, such as when the metric data type is Percentage. The string value is N/A for unanswered questions of certain data types. For the Attachment data type, the names of the attached files are displayed as comma-separated values. |
**Assessment results**
In the Assessments application, when the system processes completed questionnaires or gathers values returned from scripted metric queries, it generates assessment result records called metric and category results.

Assessment administrators can view assessment results.

The system calculates **metric results** first, normalizes the scores, and then calculates **category results**. Each metric and category result record stores data from one assessment group, for a particular category and source record evaluated. Specifically:

- Metric results: store data calculated from one evaluation of one metric.
- Category results: store data calculated from a weighted average of all metrics in the category.

**Note:** Although results data is available to view in the form of metric and category result records, the most meaningful way to view results is in **scorecards** and decision matrixes. These tools display only the most pertinent data in graphical, comparative formats.

**Excluded Responses**

The system creates metric results for responses but does not include them in category result calculations if any of the following are true:

- The user selects the Not Applicable answer option on a questionnaire.
- The user does not answer the question and the **data type** is not Checkbox.
- The question data type is one of the following: Date, Date/Time, or String.
- The metric result Actual value, Scaled value, and Normalized value fields are set to -1.

**Metric Attachments**

After a survey or assessment is submitted, any attachments that have been added by a user are moved to the metric result record. The names of the attached files are added to the **String value** field on the Metric Result form.

**Note:** You cannot add or remove attachments from a metric result.

**Assessments overview module**

The assessment overview module is a type of homepage that displays various assessment reports, such as results by category and assessments by state.

**Prerequisites**

You can view the overview page and refresh, add, delete, and rearrange report widgets.

Role required: assessment_admin
Figure 427: Assessment Overview page

Category Result Ratings by Category

Metrics by Data Type

Assessments by State

Stakeholders per Category

Answered Questions by Assigned User
To use the Assessments Overview module, navigate to Assessments Overview and click elements within the reports to obtain more information.

The available reports are:

<table>
<thead>
<tr>
<th>Report</th>
<th>Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessable Records by Type</td>
<td>Assessable Record</td>
</tr>
<tr>
<td>Assessment Instances by Assessment Group</td>
<td>Assessment Instance</td>
</tr>
<tr>
<td>Assessments by State</td>
<td>Assessment Instance</td>
</tr>
<tr>
<td>Answered Questions by Assigned User</td>
<td>Assessment Instance Question</td>
</tr>
<tr>
<td>Average Rating by Type</td>
<td>Assessment Category Result</td>
</tr>
<tr>
<td>Category Result Ratings by Category</td>
<td>Assessment Category Result</td>
</tr>
<tr>
<td>Metrics by Data Type</td>
<td>Assessment Metric</td>
</tr>
<tr>
<td>Stakeholders per Category</td>
<td>Assessment Stakeholders</td>
</tr>
<tr>
<td>Top Rated Items</td>
<td>Metric Result</td>
</tr>
<tr>
<td>Total Metrics by Metric Type</td>
<td>Assessment Metric</td>
</tr>
<tr>
<td>Unanswered Questions by Assigned User</td>
<td>Assessment Instance Question</td>
</tr>
</tbody>
</table>

Assessment results calculation
For every assessment group, there are assessment results.

Data calculated from an evaluation of one metric is classified as a metric result. Data calculated from the weighted average of all metric results in a category is classified as a category result. The system calculates some assessment results when the assessment is generated, and others when users complete questionnaires.

View a bubble chart for assessments
Assessment administrators can view bubble charts to compare the relative standing of assessable records in three metric categories.

Role required: assessment_admin or admin
1. Navigate to Assessments Admin Bubble Charts.
2. Click a Name to open the bubble chart record.
3. Under Related Links, click View Bubble Chart.

Note: Demand managers and vendor managers can view bubble charts through the Demand Management and Vendor Performance applications. See Project Portfolio Management for more information.

Bubble charts for assessments
A bubble chart is a dynamically updated graph that plots assessment results for multiple assessable records.

Assessment administrators can create and use bubble charts to compare the relative standing of assessable records in three metric categories. The X- and Y-axes each represent a different category. Assessable records are plotted on the chart as circular markers, or bubbles, which vary in size according to scores for the third category.
Create a bubble chart
Assessment administrators can create bubble charts to compare the relative standing of assessable records in three metric categories.

To create a bubble chart, navigate to Assessments Admin Bubble Charts and create a record (see table for field descriptions).

**Note:** For color fields, either HTML color names or hexadecimal (hex) values are acceptable. For hex values, the # character is optional. Values are not case-sensitive. For example, all of the following values are valid: LightGray, lightgray, #D3D3D3, d3d3d3.

![Bubble Chart form](image)

**Figure 428: Bubble Chart form**
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Descriptive name for the bubble chart. Bubble Chart is appended to the name when you view the bubble chart.</td>
</tr>
<tr>
<td>• Top left label</td>
<td>Label text for the top left, top right, bottom left, and bottom right quadrants, respectively. Choose labels that help interpret results. For example, a bubble chart that displays vendor assessment results might have the following quadrant labels, where vendors in the top right quadrant have the best scores:</td>
</tr>
<tr>
<td>• Top right label</td>
<td>• Top left label: Resource</td>
</tr>
<tr>
<td>• Bottom left label</td>
<td>• Top right label: Essential Partner</td>
</tr>
<tr>
<td>• Bottom right label</td>
<td>• Bottom left label: Poor Performer</td>
</tr>
<tr>
<td></td>
<td>• Bottom right label: Reevaluate</td>
</tr>
<tr>
<td>• Top left color</td>
<td>Border colors for the top left, top right, bottom left, and bottom right quadrants, respectively. Bubbles are the color of the quadrant they are in.</td>
</tr>
<tr>
<td>• Top right color</td>
<td></td>
</tr>
<tr>
<td>• Bottom left color</td>
<td></td>
</tr>
<tr>
<td>• Bottom right color</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Metric type associated with this bubble chart. Only results for assessable records of the selected metric type are plotted on the bubble chart.</td>
</tr>
<tr>
<td>• X-Axis label</td>
<td>Label text for the X-, Y-, and Z-axis categories of the bubble chart. These labels appear along the X- and Y-axes, if applicable, and in bubble score summary windows. The metric category name is usually a good label. If these fields are left empty, the bubble chart automatically displays the selected category names as the labels.</td>
</tr>
<tr>
<td>• Y-Axis label</td>
<td></td>
</tr>
<tr>
<td>• Z-Axis label</td>
<td></td>
</tr>
<tr>
<td>• Metric X category</td>
<td>Metric category each axis represents. Results for the Z-axis category determine the size of each bubble. The Z-axis should generally represent the most important category out of the three.</td>
</tr>
<tr>
<td>• Metric Y category</td>
<td></td>
</tr>
<tr>
<td>• Metric Z category</td>
<td></td>
</tr>
<tr>
<td>Quadrant label color</td>
<td>Color of the label text for the quadrant borders.</td>
</tr>
<tr>
<td>Default</td>
<td>Check box that enables (selected) or disables (cleared) the bubble chart as the default. There can be only one default bubble chart per metric type.</td>
</tr>
</tbody>
</table>

**Bubble chart components**

The X- and Y-axes each represent a different metric category. Assessable records are plotted on the chart as circular markers, or bubbles, which vary in size according to scores for the third category.
The bubble chart page has these components:

- **Bubble Chart**
  - X- and Y-axes: Each axis represents a metric category.
  - Bubbles: Each labeled bubble represents an average of category result data for an assessable record. Point to a bubble to view an assessable record score summary. Click a bubble or bubble label to view the scorecard for the assessable record.

- **Source record list:** List of all records defined by the Table and Condition fields for the associated metric type. Note that the bubble chart only plots records for which there are assessment results. The assessment results are actually associated with the assessable records for each of the listed source records.
### Vendor Quality Bubble Chart

This chart illustrates the quality of vendors based on reliability and alignment. Each bubble represents a vendor, with size indicating market value.

#### Companies

<table>
<thead>
<tr>
<th>Name</th>
<th>Street</th>
<th>City</th>
<th>Zip / Postal code</th>
<th>Phone</th>
<th>Updated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adobe Systems</td>
<td>345 Park Avenue</td>
<td>San Jose</td>
<td>95110</td>
<td>(408) 533-7709</td>
<td>2013-09-05 08:47:42</td>
</tr>
<tr>
<td>Adtran</td>
<td>901 Explorer Boulevard</td>
<td>Huntsville</td>
<td>35806-2807</td>
<td>(256) 963-8000</td>
<td>2013-09-05 15:29:17</td>
</tr>
<tr>
<td>Atlassian</td>
<td>350 Ellis Street</td>
<td>Mountain View</td>
<td>94043</td>
<td>(650) 527-8000</td>
<td>2013-09-05 10:50:49</td>
</tr>
<tr>
<td>Amazon</td>
<td>1200 12th Ave, South St.</td>
<td>Seattle</td>
<td>98114-2734</td>
<td>(888) 216-1072</td>
<td>2013-09-05 10:18:47</td>
</tr>
<tr>
<td>America Online</td>
<td>770 Broadway</td>
<td>New York, NY</td>
<td>10003</td>
<td>(800) 827-6354</td>
<td>2013-09-05 10:54:37</td>
</tr>
<tr>
<td>Apache Software</td>
<td>2000 Post Oak Boulevard</td>
<td>Houston</td>
<td>77066-4400</td>
<td>(713) 296-6000</td>
<td>2013-09-06 11:00:57</td>
</tr>
<tr>
<td>APC</td>
<td>520 8th Ave., 21st Floor</td>
<td>New York</td>
<td>10018</td>
<td>(212) 594-5333</td>
<td>2013-09-06 13:33:25</td>
</tr>
<tr>
<td>Apple</td>
<td>1 Infinite Loop</td>
<td>Cupertino</td>
<td>95014</td>
<td>(408) 996-1010</td>
<td>2013-09-05 10:21:57</td>
</tr>
<tr>
<td>Asus</td>
<td>850 Corporate Way</td>
<td>Fremont</td>
<td>94539</td>
<td>(510) 739-3777</td>
<td>2013-09-05 13:35:52</td>
</tr>
</tbody>
</table>
Assessable record score summaries

Point to a bubble to display a score summary for the assessable record the bubble represents.

The summary displays the assessable record's average score for each category in the following order: X-axis category, Y-axis category, Z-axis category. The scores are based on data from the last 12 months.

Figure 430: Bubble chart score summary

View an assessment scorecard

The Assessments application prepares printable scorecards. A scorecard displays easy-to-interpret assessment results, in which the current calculated ratings for an assessable record are compared to previous ratings or to the ratings of other records.

Role required: assessment_admin or admin

Users can examine ratings over time, compare ratings for one assessable record with all assessable records in a table, or compare the ratings of two assessable records. All ratings are averages for the time range selected. The system dynamically updates a scorecard each time you view it, so the ratings reflect recently completed assessments and scripted metrics.

Administrators can display a scorecard for any table by creating a Related Link on assessable records. The system provides this link on the Company form by default when Vendor Performance is active.

The Vendor Performance application provides an enhanced scorecard view for vendors.

See Vendor Performance in Project Portfolio Suite.

1. Navigate to Assessments Assessable Records.
2. Open a record.

Create a link to a scorecard

Users with the admin role can create UI actions that allow users to view scorecards from tables.

Role required: assessment_admin or admin

1. Generate assessable records you want to evaluate.

   For example, you might create a metric type called Project to assess project management records.
2. Navigate to System Definition UI Actions.
3. Open the View Scorecard record.
4. Right-click the header bar and select Insert and Stay from the context menu to create a duplicate record.
5. Change the Table name to the table on which you want the UI action to appear. For example, you might select Project [pm_project].

![UI Action Image](image)

6. Do not edit the Action name field or the Condition script.
7. Save the record.
8. Navigate to the table on which you created the UI action and open an assessable record.
   a) In this example, navigate to Project Projects All.
   b) Open any record in the list.
   c) Click View Scorecard under Related Links to open the scorecard for that assessable record.

   The scorecard appears with the title in the form of <table display name> Scorecard. For example, a scorecard for an assessable record in the Project [pm_project] table is named Project Scorecard.

**Note:** Content does not appear in the scorecard unless the associated assessable record has assessment results or related live feed conversations.
9. Insert a new View Scorecard UI action record for each table where you want the related link to appear.

*Export a quiz scorecard as an image*

You can export scorecards as images.

**Role required:** assessment_admin or admin

1. Click the menu icon and select Save as PNG or Save as JPEG as the download format.
2. When the export is complete, select Download to save the scorecard image to a storage location.

---

**Assessment scorecard averages**

The Averages view compares the current ratings for an assessable record in each metric category with the average, minimum, and maximum values from all assessable records in the filter. All ratings are from assessments generated over the trailing twelve months (TTM).

Select a filter option to compare the current record against all assessable records in that filter. An assessment administrator configures these options in the Filter field field in the Assessment Metric Type form.

Rating variances are highlighted as follows:

- **Red:** Ratings are below average in this category. The Diff value displays a negative number.
- **Green:** Ratings are above average in this category. The Diff value displays a positive number.
- **White:** Ratings are average in this category. The Diff value is 0.0.
In the following example, the ratings of the current group are compared against other groups for which Don Goodliffe is the manager.

**Figure 431: Group scorecard with ratings filter**

*Assessment scorecard categories*

The Categories view displays a bar chart showing the average ratings for each category in the selected time interval.

Select from these reporting periods:

- All History
- Last 3 Months
- Last 12 Months
Figure 432: Scorecard categories

Assessment scorecard category metrics
The Category Metrics view displays the weighted average results for each metric within a category. Use this view to learn how individual metrics affect the overall rating for the category.

Select a metric category from the choice list to display the chart.
Figure 433: Scorecard category metrics

Assessment scorecard head-to-head compare view
The Head to Head Compare view allows you to compare the ratings of two assessable records of the same type. Select an assessable record from the choice list to compare against the current record's trailing twelve month (TTM) ratings.

Head to head compare
The Diff column displays the difference between each assessable record's most recent TTM ratings. By default, the system selects the first assessable record in the list when you open this view. The scorecard displays three years of ratings for the comparison record. All ratings are expressed as averages.
Overall Rating

The Overall Rating is calculated as:

\[
\text{Overall Rating} = \frac{\text{sum of normalized values in category result}}{\text{number of assessment groups}}
\]

In the following example, the calculation is

\[
\frac{(2.13 + 2.86 + 3.79 + 1.43 + 2.39 + 3.7)}{2} = 8.15
\]
<table>
<thead>
<tr>
<th>Assessment group</th>
<th>Category</th>
<th>Weight</th>
<th>Source</th>
<th>Rating</th>
<th>Normalized value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASG0010010</td>
<td>Politeness</td>
<td>5</td>
<td>Group: NY DB</td>
<td>9.37</td>
<td>2.13</td>
</tr>
<tr>
<td>ASG0010010</td>
<td>Recommendation</td>
<td>7</td>
<td>Group: NY DB</td>
<td>9</td>
<td>2.86</td>
</tr>
<tr>
<td>ASG0010010</td>
<td>Responsiveness</td>
<td>10</td>
<td>Group: NY DB</td>
<td>8.34</td>
<td>3.79</td>
</tr>
<tr>
<td>ASG0000804</td>
<td>Politeness</td>
<td>5</td>
<td>Group: NY DB</td>
<td>6.29</td>
<td>1.43</td>
</tr>
<tr>
<td>ASG0000804</td>
<td>Recommendation</td>
<td>7</td>
<td>Group: NY DB</td>
<td>7.5</td>
<td>2.39</td>
</tr>
<tr>
<td>ASG0000804</td>
<td>Responsiveness</td>
<td>10</td>
<td>Group: NY DB</td>
<td>8.14</td>
<td>3.7</td>
</tr>
</tbody>
</table>

Figure 435: Normalized values
Figure 436: Overall Rating on the Group Scorecard

Assessment scorecard history
The History view compares the current ratings for each category with ratings from the previous three years or four quarters.

Ratings that have declined are highlighted in red and display negative numbers. Ratings that have improved are highlighted in green with positive numbers. Arrow icons beside the values in the Diff column indicate the trend of the current assessment against the previous assessment.

- 3 Years: To calculate the current ratings, the system averages the ratings from the trailing twelve month (TTM) period. The Diff column shows the discrepancy between the current ratings and the previous calendar year's ratings.
Figure 437: Scorecard history - 3 years

- 4 Quarters: Quarterly assessments compare the average rating for each category in the current quarter against the average ratings from the previous four quarters. The Diff column shows the discrepancy between the current ratings and the previous quarter's ratings. The column labels count backward, by quarter from the current quarter. For example, if the current quarter is the 3rd quarter of 2013, then the previous quarters appear as 2nd [2013], 1st [2013], 4th [2012], and 3rd [2012]. All four of the previous quarters appear, whether or not there was any data for those quarters.

Figure 438: Scorecard history - 4 quarters

*Live feed view of assessable records*

The live feed view displays live feed conversations that apply to the assessable record. Users can view the group feed, including tagged comments, and add comments of their own.
To configure a live feed view, an assessment administrator selects the Live feed check box on the Assessable Record form. Live feed is available on the scorecard even if there are no category results for the other views.

The live feed view provides these viewing options:

- My Feed: Displays the user's My Feed preferences.
- Company: Displays the user's company feed.
- Groups: Displays all available groups and gives the logged in user the option to leave or join a group. Select a group to display that group's conversations.
- Tags: Displays all the tags found in live feed comments. Click a tag to display the conversations containing that tag.
Figure 439: Live Feed group scorecard
Assessment scorecard ratings

The scorecard ratings section displays various ratings for the assessable record.

Select one of several views that present different ratings:

- Averages
- Categories
- Category Metrics
- Head to Head Compare
- History
- Live Feed

Some views display an overall rating column, which lists categories used to evaluate the assessable record. Only categories in which the assessable record has been evaluated appear on the scorecard. If the ratings section does not display any data, the assessable record or category results associated to the assessable record have been deleted.

Click a category to view the category record. Point to a category to display a line chart that shows the rating trend for that category.

Figure 440: Vendor scorecard trend chart

Set up and administer quizzes

Set up and administer quizzes.

Role required: assessment_admin or admin

1. Create reusable question templates for quizzes.
2. Create the quiz using the Quiz Designer or with forms accessed from the navigation menu.
   The quiz record includes specifics such as duration, notification preferences, a questionnaire introduction, and ending notes displayed to recipients.
3. Edit the default category or create additional categories as needed.
   The system creates a category with the same name as the quiz.
4. Define users for each category.
   These are the recipients who answer the questions in a category. You can define different users for each category.
5. Create the questions for each category.
6. Create the answers for each question and determine if the questions are scored.

   You can create unique answers or select preconfigured answers from a template.

Publish and distribute the quiz. You can send the quiz to a single user or all users in each category.

Review the results from the submitted quizzes in reports and scorecards.

Quizzes
Quizzes are questionnaires you can assign to one or more users to assess their knowledge of any subject. The quiz functionality is built on the assessment engine and provides many of the same features as assessments and surveys.

Each question is scored, and the overall score indicates the percentage of questions the user answered correctly. A quiz may have categories of questions that are assigned only to some users. You can assign weighting values to individual questions or categories of questions that make them more or less important when calculating the overall score. Quizzes require activation by a system administrator.

- An administrator can create a quiz for any purpose and assign it to a single user or multiple users.
- A quiz can contain one or more categories of questions. Each category can be assigned to users who answer only the questions in that category.
- The system can send email notifications to these users:
  - Recipients: The recipient can receive notification of an assigned quiz, a quiz whose allowed duration is at 50%, and a quiz that is overdue.
  - Recipient's manager: The recipient's manager can receive notification when a quiz is overdue.
  - Quiz manager: The quiz manager can receive notification of an overdue quiz to which he or she is assigned.

- Quizzes can contain questions that are scored or not scored. Unscored questions assess opinions or involve dates and are not counted in the final score. Scored questions specify correct answers and are scored either as 0% or 100%. You can apply a weighting scale to scored questions to establish their relative importance. You can designate questions with these data types as scored questions:
  - Checkbox
  - Choice
  - Duration
  - Likert Scale
  - Numeric Scale
  - Template
  - Yes/No

- A quiz question can be dependent on the response to any scored question. For example, you can create a dependent question requesting additional information that appears only if a recipient answers No to a specific question.

Important terms

The quiz application involves several terms.
Table 1029: Terms used in quiz application

<table>
<thead>
<tr>
<th>term</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes</td>
<td>A quiz contains information such as duration, state, and notification controls and lists the existing categories. Text fields on the quiz form allow an administrator to create introductory content and end notes that are displayed to the recipient.</td>
</tr>
<tr>
<td>Categories</td>
<td>A quiz category represents a theme for quiz questions. Each category contains one or more questions and names the recipients for the questions in that category. By default, the system creates one category with the same name as the quiz. You can create additional categories as needed. Categories can be weighted higher or lower to determine the importance of that category in the overall score.</td>
</tr>
<tr>
<td>Questions</td>
<td>A quiz question is a question configured for a category and sent only to the users for that category. Questions have a wide variety of data types and can be individually weighted higher or lower. Questions may be scored or unscored.</td>
</tr>
<tr>
<td>Category user</td>
<td>A category user is the recipient of questions for a specific category. You can select different users to answer the questions for each category.</td>
</tr>
<tr>
<td>Templates</td>
<td>A template is a question data type that provides reusable rating scales for answers to questions. For example, the answer template named Satisfaction contains a satisfaction scale ranging from Very Satisfied to Very Dissatisfied.</td>
</tr>
</tbody>
</table>

**Quiz roles**

The Quizzes application uses these roles. No role is required to take quizzes that are assigned to you.

Table 1030: Quiz roles

<table>
<thead>
<tr>
<th>Role Title [Name]</th>
<th>Role Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>assessment administrator [assessment_admin]</td>
<td>Can administer the Assessments application and all quiz records. Can access all the modules of the Assessments application.</td>
</tr>
</tbody>
</table>

**Note:** The itil_admin role and the survey_admin role contain the assessment_admin role.
Role Title [Name]                           Role Description
Administrator [admin]                        Can access all aspects of the assessment and survey processes. Only administrators can modify survey notifications, create survey modules, and import surveys.

Data types for quizzes
You need to choose a data type for each quiz question. Various data types helps you collect and analyze different kinds of data.

Table 1031: Available data types

<table>
<thead>
<tr>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attachment</td>
<td>Question with a Manage Attachments icon that allows users to attach one or more files.</td>
</tr>
<tr>
<td>Boolean</td>
<td>Question with a check box or a Yes/No list for user responses.</td>
</tr>
<tr>
<td>Choice</td>
<td>List of predefined options. For more information, see the definition for Choices in the Create quiz questions on page 2354 topic. Multiple correct answers are supported.</td>
</tr>
<tr>
<td>Date</td>
<td>Date field.</td>
</tr>
<tr>
<td>Date/Time</td>
<td>Time and date field.</td>
</tr>
<tr>
<td>Number</td>
<td>Number field with predefined minimum and maximum values. The default is 1-10.</td>
</tr>
<tr>
<td>Percentage</td>
<td>Percentage field with a prescribed range.</td>
</tr>
<tr>
<td>Scale</td>
<td>Predefined Likert scale. Answer options appear as radio buttons. Multiple correct answers are supported.</td>
</tr>
<tr>
<td>Image Scale</td>
<td>Predefined set of images. Five emojis similar to the Likert scale (very dissatisfied to very satisfied) are provided. However, you can upload additional images in JPG, PNG, or GIF format. Multiple correct answers are supported.</td>
</tr>
<tr>
<td>Numeric scale</td>
<td>Selectable number scale. The default is 1-5. Answer options appear as radio buttons. Multiple correct answers are supported.</td>
</tr>
<tr>
<td>String</td>
<td>Single or multi-line text field.</td>
</tr>
<tr>
<td>Template</td>
<td>Choice list of templates that provide a predefined scale of options. For details, see Configure a template question. Multiple correct answers are supported.</td>
</tr>
<tr>
<td>Reference</td>
<td>Choice list of fields from a specified reference table. This data type does not support reference qualifiers.</td>
</tr>
</tbody>
</table>
Activate the quiz designer
Administrators can activate the Quiz Designer plugin.

Role required: assessment_admin or admin

1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.
   - If the plugin depends on other plugins, these plugins are listed along with their activation status.
   - If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).
4. If available, select the Load demo data check box.
   - Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.
   - You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.
5. Click Activate.

Quiz Overview module
The Quiz Overview module is a homepage that displays various reports on data such as results for each category and quizzes that are complete, pending, or in progress.

Role required: assessment_admin or admin

Users with the assessment_admin role can view the overview page and refresh, add, delete, and rearrange widgets.

1. Navigate to Quizzes Overview.
2. Click elements within reports to obtain more information. The available reports are:

<table>
<thead>
<tr>
<th>Report</th>
<th>Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes by State</td>
<td>Assessment Instance [asmt_assessment_instance]</td>
</tr>
<tr>
<td>Total Questions by Quiz</td>
<td>Assessment Metric [asmt_metric]</td>
</tr>
<tr>
<td>Questions by Data Type</td>
<td>Assessment Metric [asmt_metric]</td>
</tr>
<tr>
<td>Correct Answers by Assigned User</td>
<td>Metric Results [asmt_metric_result]</td>
</tr>
<tr>
<td>Number of Correct Answers</td>
<td>Metric Results [asmt_metric_result]</td>
</tr>
<tr>
<td>Incorrect Answers by Assigned User</td>
<td>Metric Results [asmt_metric_result]</td>
</tr>
<tr>
<td>Number of Incorrect Answers</td>
<td>Metric Results [asmt_metric_result]</td>
</tr>
</tbody>
</table>

Quiz designer
The quiz designer provides a single interface that users with the assessment_admin role can use to create, edit, and distribute quizzes.

You can also use it to edit existing quizzes and change scoring parameters.

Alternatively, you can use the modules of the assessment engine to create and edit the records that make up a quiz. All quiz records are stored in assessment tables and displayed in Quiz views of those tables. For details, see Create quizzes with forms.
Tools on the Quiz Designer

The quiz designer includes a design canvas, a header bar, and many controls that you can use to create quizzes.

To open the quiz designer, navigate to Quizzes Quiz Designer.

The designer contains the following elements:

- Controls
- Header bar
- Design canvas

Controls

Controls for the supported question data types are available in the Controls palette. Drag and drop a control onto the designer canvas to create a question of that type.
Table 1032: Question controls

<table>
<thead>
<tr>
<th>Data type</th>
<th>Description</th>
<th>Scored</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attachment</td>
<td>Question with a Manage Attachments icon that allows users to attach one or more files.</td>
<td>Y</td>
</tr>
<tr>
<td>Boolean</td>
<td>Question with a check box or a Yes/No list for user responses.</td>
<td></td>
</tr>
<tr>
<td>Data type</td>
<td>Description</td>
<td>Scored</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
<td>--------</td>
</tr>
<tr>
<td>Choice</td>
<td>List of predefined options. For more information, see the definition for Choices <a href="#">Create quiz questions</a> on page 2354. Multiple correct answers are supported.</td>
<td>Y</td>
</tr>
<tr>
<td>Date</td>
<td>Date field.</td>
<td>N</td>
</tr>
<tr>
<td>Date/Time</td>
<td>Date and time field.</td>
<td>N</td>
</tr>
<tr>
<td>Number</td>
<td>Number field with predefined minimum and maximum values. The default is 1-10.</td>
<td>N</td>
</tr>
<tr>
<td>Percentage</td>
<td>Percentage field with a prescribed range.</td>
<td>N</td>
</tr>
<tr>
<td>Scale</td>
<td>Predefined Likert scale. Answer options appear as radio buttons. Multiple correct answers are supported.</td>
<td>Y</td>
</tr>
<tr>
<td>Numeric Scale</td>
<td>Selectable number scale. The default is 1-5. Answer options appear as radio buttons. Multiple correct answers are supported.</td>
<td>Y</td>
</tr>
<tr>
<td>Image Scale</td>
<td>Predefined set of images. Five emojis similar to the Likert scale (very dissatisfied to very satisfied) are provided. However, you can upload additional images in JPG, PNG, or GIF format. Multiple correct answers are supported.</td>
<td>Y</td>
</tr>
<tr>
<td>String</td>
<td>Single or multiline text field.</td>
<td>N</td>
</tr>
<tr>
<td>Template</td>
<td>Choice list of templates that provide a predefined scale of options. For details, see <a href="#">Configure a template question</a>. Multiple correct answers are supported.</td>
<td>Y</td>
</tr>
<tr>
<td>Reference</td>
<td>Choice list of fields from a specified reference table. This data type does not support reference qualifiers.</td>
<td>N</td>
</tr>
</tbody>
</table>

**Header Bar**

The header bar contains tabs that display different views and a menu of various functions.

Click one of the following tabs to change the view in the canvas:
• Design: Add categories and questions, and configure the properties of each. This is the default view of the canvas when you open the designer.
• Configuration: Create introductions and end notes for quizzes, and select a signature.
• Availability: Select the recipients for each category in the quiz.

Point to the menu icon (≡) in the in the upper right of the quiz designer to select the following options:
• Save: Saves the current quiz.
• Preview: Displays a preview of the quiz as it appears to the recipients.
• Publish: Distributes the quiz to the selected recipients.
• Save and Publish: Saves and distributes the quiz in one step.
• New Quiz: Opens a fresh canvas for a new quiz.
• Load Quiz: Opens a list of existing quizzes that you can select and edit.
• Copy Quiz: Creates a copy of the quiz.

The availability of each option depends on the status of the quiz that is opened in the quiz designer.

Design Canvas

New quizzes open in the Design view. The quiz Name field appears above first category in the canvas. A blank question field appears in the category container.

Create a quiz

When you create a quiz, you can create one or more categories and then add questions to each category.

Role required: assessment_admin or admin

Each category can be assigned to a different user or the same users. You can also customize each question and make it dependent on the response to another question.

Create a quiz using these procedures:

Create quiz categories

A category represents a theme for evaluating a specific element of the quiz topic and contains questions pertaining to that theme.

Role required: assessment_admin or admin

When you create a quiz, the system creates a default category, using the name of the quiz. You can use this category, modify it, or create additional categories as needed. To have any results, a category must contain scored questions.

1. Navigate either Quizzes Quiz Designer or Quizzes Quizzes and click Quiz Designer in the list header.
2. Enter the name of the quiz in the Name field. The system uses this name as the name of the quiz and the first category
3. To configure the category, click the gear icon in its title bar.

The Properties dialog box appears. You can change the name of the category, add a description for it, and enter text in the Details field that introduces or explains the category to the recipients. The system updates the category as you type.
4. Click the X icon to close the category properties dialog box and save your settings.
5. To add a new category, click the + icon in the title bar of an existing category.

Create quiz questions
You can create multiple questions for each category but each question can be associated with only one category.

Role required: assessment_admin or admin

The data type that you select for each question determines how it can be answered by quiz recipients.

You can designate questions to be scored. Only scored questions are shown in the quiz results and considered when calculating the category results. You must also specify a correct answer for scored questions.

**Note:**
To designate a question as scored, you must use Assessment forms. For instructions, see Configure a scored question.

1. In the Design view, drag a data type icon from the Controls palette and drop it into a category container.
2. To configure the question, click in the gear icon in its title bar. The Properties dialog box appears for the question.
3. Fill in the fields on the form, as appropriate.

**Table 1033: Question property fields**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>[Required] Name of the question. Create a concise and easily recognizable name for your question. The system uses this value to identify the question in Assessment Metric lists and in scorecard charts.</td>
</tr>
<tr>
<td>Question</td>
<td>Text to display as the question on quizzes. Enter a clear, straightforward question that is easy to understand.</td>
</tr>
<tr>
<td>Type</td>
<td>[Read-only] Data type selected for this question. See the table in <em>Controls</em> for possible data types.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Active</td>
<td>Check box that determines whether this question is available on a quiz. If a question is marked inactive, it does not appear on quizzes generated after the question becomes inactive.</td>
</tr>
<tr>
<td>Boolean option</td>
<td>Whether a check box or a Yes/No list appears as the option for the Boolean question.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Check box for requiring users to answer the question. Users cannot submit quizzes until they answer all mandatory questions, which are denoted by a red field status indicator. This field is available when the question does not have a dependency and the question Controls is not Boolean with a check box option.</td>
</tr>
</tbody>
</table>
| String option       | Setting for the appearance of a string field in a question. This field is available when the question type is String. The string options are:  
                      • Single line: Single line text field 40 characters in length that allows strings of any length.  
                      • String line wide: Full page width text field that allows a single line entry of any length.  
                      • Multiline: Full page width multi-line text field that allows word wrap and returns. |
<p>| Min                 | Lowest positive whole number that users can enter or select to answer the question. This field is available when the question type is Number, Percentage, or Numeric Scale.                                           |
| Max                 | Highest positive whole number that users can enter or select to answer the question. This field is available when the question type is Number, Percentage, or Numeric Scale.                                           |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allow not applicable</td>
<td>Check box for including Not Applicable as an option for this question. Users can select Not Applicable if they do not have sufficient information to respond to a question. User responses of Not Applicable are excluded from results calculations. This field is available when the question does not have a dependency and the question data type is not Boolean with a check box option.</td>
</tr>
<tr>
<td>Randomize answers</td>
<td>Check box for displaying answer options in a random order whenever the question appears in a quiz. Answer preference is sometimes influenced by the order in which options appear, which can result in biased results. Randomizing options can help prevent this bias. Note: Randomizing options for certain questions may make those questions confusing for users. In general, only randomize options that do not follow a logical order.</td>
</tr>
<tr>
<td>Details</td>
<td>Information about the question that is displayed on the quiz. Include details that help users understand how to answer the question. You can also enter HTML text in this field with the WYSIWYG editor. For example, include HTML to embed links and images.</td>
</tr>
<tr>
<td>Correct answer</td>
<td>Answer option that you want to be selected by users. When you specify a correct answer for a question, the system scores the question. This field is available for all data types except Date, Date/Time, and String. Multiple correct answers are supported for a few data types. See data types.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Choices</td>
<td>Options for a question with a data type of Choice or Scale. The system automatically adds text and values that you can edit for each option. Click the + icon to add an option, or click the X icon to delete an option. By default, the system arranges options in the order established by their values. To change the order, drag and drop the options.</td>
</tr>
</tbody>
</table>

**Dependency**

| Displayed when | Condition builder that hides or displays the question depending on the answer to another question in the same category. Select an existing question from the list with a data type of Boolean, Choice, Scale, or Template. Create the condition that must exist for recipients to see the dependent question, using the is or is one of operator. The system prevents recursive dependencies between questions. For example, if Question A depends on Question B, Question B cannot depend on Question A. |

4. To create any special conditions that must be met for a question to appear on the quiz, click the Dependency tab. Fill in the fields, as appropriate.

   Dependent questions appear on the quiz when a recipient selects a specific answer or combination of answers to another question in the same category

5. Select a question in the Displayed when field. The system selects the appropriate operator and displays the possible answers for the selected question.

6. Select the answers that satisfy the condition. Selected answers are indicated by a check mark.
7. Click X to close the question properties dialog box and save your settings.
8. To add a question with the same data type as an existing question in the category, click the + in the title bar of the existing question.
9. Drag questions to change their order within a category or move them between categories.
10. To delete a question, click the X in its title bar.

Configure a quiz
You can configure an entire quiz.
Role required: assessment_admin or admin
The values you enter and select on this page are applied to the entire quiz.
In the quiz designer, click Configuration and then fill in the fields as described in the table.

<table>
<thead>
<tr>
<th>Table 1034: Quiz designer configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Field</strong></td>
</tr>
<tr>
<td>Active</td>
</tr>
<tr>
<td>Description</td>
</tr>
<tr>
<td>Field</td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td>Introduction</td>
</tr>
<tr>
<td>Signature</td>
</tr>
<tr>
<td>Return URL</td>
</tr>
<tr>
<td>End note</td>
</tr>
<tr>
<td>Duration</td>
</tr>
<tr>
<td>Manager</td>
</tr>
<tr>
<td>Notify manager if overdue</td>
</tr>
</tbody>
</table>
Select a quiz recipient
When the system distributes a quiz, it sends email notifications to the category users and their managers.

Role required: assessment_admin or admin

A category can have one or more assigned users, and the same user can be assigned to more than one category.

The system also creates a link to the quiz in the recipients’ My Assessments & Surveys portal. Users can only answer questions in the categories that they are assigned to.

To select the recipients for each quiz category, click Availability and then fill in the fields as described in the table.

**Table 1035: Select recipients**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select category</td>
<td>Category for which the selected users are recipients.</td>
</tr>
<tr>
<td>Add users</td>
<td>Users selected as recipients for this category. The choice list shows all users in the system.</td>
</tr>
</tbody>
</table>

Publish a quiz
When you publish a quiz, the system sends email notifications to the recipients and to their managers. A card in each recipient's My Assessments & Surveys portal displays a link to the quiz.

Role required: assessment_admin or admin

1. If you want to see the quiz as the recipients will see it, point to the menu icon in the upper right of the quiz designer and click Preview.
2. When you are satisfied with the quiz, click Save and Publish or Publish to distribute it.
Create quizzes with forms
As an alternative to the Quiz Designer, you can create a complete quiz using records in the Assessment application.

All the elements of a quiz, the categories, questions, and answers, are stored in tables used by the assessment engine and are displayed in quiz views of these tables. Users creating quizzes in the Assessment application must have the assessment_admin role.

Create a quiz using assessment forms by following the procedures in the order shown here:

• Create the quiz.
• Set up the categories.
• Create the questions for the quiz.
• Create the answers for the questions.
• Distribute the quizzes to recipients.

**Note:** The recommended method of creating and editing quizzes is to use the quiz designer, which provides a single, intuitive interface for creating and editing quizzes quickly. If you determine that you need to add specific features to your quiz not offered through the quiz designer, you can do so by using some of the specific procedures described here.

Set up a category
A category represents a theme for evaluating a specific element of the quiz topic and contains questions pertaining to that theme.

When you create a quiz, the system creates a default category with the name of the quiz. You can use this category, modify it, or create additional categories as needed. Categories are records in the Quiz view of the Metric Category table.

Categories have **weighting values** that contribute to the overall score for the quiz. By default, all categories are given a weighting value of 10. You can assign any weight to your categories. To have any results, a category must contain scored questions.

You can create a new category or edit an existing one from the Metric Categories related list of a quiz record.
Select a user for a category

Category users are the recipients of the questions for each category.

A category can have one or more assigned users, and the same user can be assigned to more than one category. When the system distributes a quiz, it sends an email notification, if configured, to the category users and creates a link to the appropriate questionnaire in their assessments and surveys portal. Users can only answer questions attached to their assigned categories.

To select users for a category, select the Users related list in a category record, and click Edit.
Create questions
A category can have multiple questions associated with it.

Each question can only be associated with one category. Each question has an answer data type that determines how recipients answer the question. Questions are records in the Quiz view of the Assessment Metric table.

To create questions, open a category record and create a question record from the Assessment Metrics related list. Alternatively, you can navigate to Quiz Management Questions and create a new record (see table).

**Warning:** When you create a Choice or Likert Scale question, you must reopen the Assessment Metric form after you submit it to create answers. If you distribute a questionnaire without creating the answers for questions with these data types, recipients are unable to answer the questions. If the questions are mandatory, the recipients are unable to submit their questionnaires.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>[Required] Name of the question.</td>
</tr>
<tr>
<td>Category</td>
<td>[Required] Category the question belongs to. The system populates this category if you create a new question from the Metric Category form.</td>
</tr>
</tbody>
</table>

**Note:** You cannot change the category if the Depends on field is set or if another metric depends on this metric.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
</table>
| Method     | Setting that determines how to use the question.  
- Assessment: Makes the question available on a quiz distributed to users. The Assessment method is compatible with all data types except Duration.  
- Script: Queries the database without user participation. Scripted questions are of limited value for quizzes, because they do not assess a user's knowledge of a topic.  

**Note:** If you select a Data type that is incompatible with the selected Method, the system automatically changes the Method to the correct value. |
| Weight     | Numeric value that represents the importance of this question relative to other questions in the same category. By default, the weight is 10. For weighting suggestions, see *weight categories and metrics*. This field is available and required unless the Data type is Date, Date/Time, or String. These data types are not included in results calculations. |
| Order      | [Required] Numeric value that determines the order of the question in the category. The question with the smallest order value appears as the first question in the category's section. By default, the order is 100.  

**Note:** It does not matter which order value you use for metrics with the Script method, because they do not appear on questionnaires. |
<p>| Active     | Check box that determines whether this question appears on quizzes. If a question is inactive, it does not appear on quizzes generated after the question becomes inactive. |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandatory</td>
<td>Check box for requiring users to answer the question. Users cannot submit questionnaires until they provide valid responses to all mandatory questions, which are denoted by a red field status indicator. This field is available only if the Method is Assessment, the Depends on field is empty, and the Data type is not Checkbox.</td>
</tr>
<tr>
<td>Allow not applicable</td>
<td>Check box for including Not Applicable as a possible answer for this question. Users can select Not Applicable if they do not have sufficient information to respond to a question. User responses of Not Applicable are excluded from results.</td>
</tr>
<tr>
<td>Question</td>
<td>The question that is displayed in quizzes. Enter a clear, straightforward question that is easy to understand.</td>
</tr>
<tr>
<td>Details</td>
<td>Information about the question and what it evaluates. Include details that help users understand how to answer the question or when you need HTML enhanced details for your question. You can create HTML text in this field with the WYSIWYG editor, such as embedding links and images.</td>
</tr>
<tr>
<td>Depends on</td>
<td>An existing question that this question is dependent on. You can select Checkbox, Choice, Likert Scale, Template, and Yes/No questions from the same category as this question. Then use the Displayed when field to set the conditions for displaying this question. The system prevents the creation of recursive dependencies between questions. For example, if Question A depends on Question B, Question B cannot depend on Question A.</td>
</tr>
<tr>
<td>Question Type</td>
<td>[Required] Format of the expected response data. See the table of data types for details.</td>
</tr>
</tbody>
</table>

**Note:** You cannot change the data type if another question depends on this question.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomize answers</td>
<td>Check box for displaying the possible answers for this question in a random order whenever the question appears. Answer preference is sometimes influenced by the order in which answer options appear, which can result in biased results. Randomizing answer options can help prevent this bias. This check box is available only if the Data type is Choice or Likert Scale. Note: Randomizing answer options for certain questions may make those questions confusing for users. In general, only randomize answer options that do not follow a logical order.</td>
</tr>
<tr>
<td>Scale definition</td>
<td>Setting that determines whether lesser or greater numerical values equate to a good score in quiz result calculations. Select Low if lesser numerical values are better. Select High if greater numerical values are better. The default value is High. This field is available and required unless the Data type is Date, Date/Time, or String. The results for these data types are not included in results calculations. When the Scored check box is selected, the scale value is set to High and the field is hidden. Note: For information about how to set the scale definition for data types that do not require you to set a numerical value, see Data types for assessments on page 2264.</td>
</tr>
<tr>
<td>Min</td>
<td>Lowest numerical value that can be used as an answer option. This field is available and required only if Data type is Number, Duration, or Percentage.</td>
</tr>
<tr>
<td>Max</td>
<td>Highest numerical value that can be used as an answer option or scaled value. This field is available and required if Data type is Number, Duration, or Percentage.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>String option</td>
<td>Setting for the appearance of a string field in a question. This field is available when the question type is String. The string options are:</td>
</tr>
<tr>
<td></td>
<td>• Single line: Single line text field 40 characters in length that allows strings of any length.</td>
</tr>
<tr>
<td></td>
<td>• String line wide: Full page width text field that allows a single line entry of any length.</td>
</tr>
<tr>
<td></td>
<td>• Multiline: Full page width multiline text field that allows word wrap and returns.</td>
</tr>
<tr>
<td>Scored</td>
<td>Check box for using answers in scoring the category results and showing them in the quiz results. Scored questions are available for these data types:</td>
</tr>
<tr>
<td></td>
<td>• Choice</td>
</tr>
<tr>
<td></td>
<td>• Likert Scale</td>
</tr>
<tr>
<td></td>
<td>• Template</td>
</tr>
<tr>
<td></td>
<td>• Checkbox</td>
</tr>
<tr>
<td></td>
<td>• Yes/No</td>
</tr>
<tr>
<td></td>
<td>Selecting this check box hides the Scale definition field and sets the value in that field to High.</td>
</tr>
<tr>
<td>Correct answer</td>
<td>[Required] Desired answer to a scored question. This field is available when the Scored check box is selected. Multiple correct answers are supported for a few data types. See Data types for quizzes on page 2348.</td>
</tr>
<tr>
<td>Template</td>
<td>Answer template to use with this question. This field is available when the Data type is Template.</td>
</tr>
<tr>
<td>Related List</td>
<td></td>
</tr>
<tr>
<td>Assessment Metric Definitions</td>
<td>List of options for this question. This related list is available only if the Data type is Choice or Likert Scale.</td>
</tr>
</tbody>
</table>

Create answers for questions

Questions with Choice or Likert Scale data types must have defined answer options, called metric definitions.

When you create a question with one of these data types, the Assessment Metric Definitions related list appears. Each metric definition appears as one answer option for a question on a quiz. For example,
the question What type of men’s trousers are not permitted by company policy? might have these three answers configured as metric definitions: Slacks, Jeans, and Casual cotton.

To create an answer option, open the question record you want to edit and click New in the Assessment Metric Definitions related list. Be sure to give each option a Value. The system uses this number to establish the order in which the answers appear in the quiz.

Distribute a quiz

When you finish configuring the answers for the quiz questions, you are ready to distribute the quiz.

You can send the quiz to all the category users configured for the quiz or to a single category user.

1. Navigate to Quiz Management Quizzes.
2. Open the quiz record, and click Publish. The quiz is placed in the Published state, and it is sent to all its category users. You can edit and resend published quizzes. See Modifying Published Quizzes to learn how various modifications affect the quiz contents.
3. To resend a quiz, click the appropriate button:
   • Assign Quiz: Send the quiz to one category user.
   • Send Quizzes: Send the quiz to all of its category users.

**Note:** These buttons are hidden if there are no category users defined for the quiz.
Modify a published quiz
Post changes to existing questions immediately. Make new questions available to users who have not started the quiz.

You can edit a quiz even after it has been distributed, with these results:

- Added questions are available only on quizzes that are distributed after this change.
- Changes to existing questions are immediately available to users before the quiz is submitted or during the retake period. This includes changes to the answers, such as additional choices or changes to the data type.
- Deleted questions are also deleted from the distributed quizzes in users' queues.

**Edit a quiz**

You can update a quiz after the quiz has been distributed.

Role required: assessment_admin or admin

You can only edit a quiz that has the same application scope as that of your current session.

- Questions that you add are available only on quizzes that are distributed after the update.
- Before a quiz is submitted or during the retake period:
  - Changes to existing questions are immediately available to users. This includes changes to the answers, such as additional choices or changes to the data type.
  - Deleted questions are deleted from distributed quizzes in users' queues.

**Open the quiz:**

Group the Service Details form with one of the following options:

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes Quiz Designer</td>
<td>Point to the menu icon in the quiz header bar and select Load Quiz.</td>
</tr>
<tr>
<td>Quizzes Quizzes</td>
<td>Right-click a quiz in the list and select Quiz Designer.</td>
</tr>
<tr>
<td>Quizzes Quizzes</td>
<td>Open a quiz from the list and click Quiz Designer in the header of the Assessment Metric Type form.</td>
</tr>
</tbody>
</table>

**Configure a scored question**

Only scored questions are considered when calculating category and quiz results.

Role required: assessment_admin or admin

A question must have a correct answer specified to be scored. Only results for scored questions are displayed in the quiz scorecard.

1. Navigate to Quizzes Quizzes.
2. Open the quiz containing the questions you want to mark as scored.
3. In the Metric Categories related list on the Assessment Metric Type form, select the category for the questions you want to mark as scored.
4. In the Assessment Metrics related list on the Metric Category form, select a question from the list.
5. In the Question Type section of the Assessment Metric form, select the Scored check box.
   - This check box is not available if the question's data type is not supported for scoring.
6. Select the Correct answer for the question.
7. Click Update.
8. Repeat the process for all the questions in the category that you want the system to score.
9. Return to the list of metric categories, select another category, and configure scoring for the appropriate questions in that category.

Configure a template question
You can configure template questions when designing quizzes.

Role required: assessment_admin or admin

1. Drag the Template data type icon into a category container.
2. Click the gear icon in the question title bar to open the template properties dialog box.
3. Select a predefined scale from the list.

Question entry fields appear for that template.
4. Enter one or more questions that are appropriate for the template.
5. Click the arrow to the right of a question to configure its properties. You must provide a name for each question.
6. Click the up or down arrow to move between questions, or click the back arrow to return to the template properties dialog box.
7. Configure the properties for the remaining questions.
8. Click the X icon to close the template properties dialog box and save your settings.

Enable a quiz retake
You can configure a quiz to allow recipients to resubmit their answers as many times as they like, until the quiz’s due date.

Role required: assessment_admin or admin

Results are not calculated until the quiz’s configured duration has elapsed. The card in the user’s queue remains visible until the quiz’s due date and displays a button to allow retakes.

1. Navigate to Assessments Metric Definition Types.
2. Remove the Evaluation method = Assessment filter condition so you can see all the records in the list.
3. Open the quiz.
4. In the Assessment Metric Type form, select the Allow retake check box and save the record.
**View a quiz result**
You can view quiz results for each question and category, or view the quiz scorecard for a detailed breakdown.

Role required: assessment_admin or admin

Quiz results are stored in the Metric Result [asmt_metric_result] table and display recipients' answers to each question in a category.

Navigate to Quizzes Quiz Results.

---

**Quiz reports**

Quizzes provide several global reports so that assessment administrators can view important statistics.

You can share these reports with specific users or groups and change the display options.

For detailed field information and reporting options, click the link for the chart Type. To sort a column in ascending or descending order, click the arrow in the column heading.

<table>
<thead>
<tr>
<th>Table 1036: Quiz reports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>Quizzes by State</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Total Questions by Quiz</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Type</td>
</tr>
<tr>
<td>-------------------------------------------</td>
</tr>
<tr>
<td>Questions by Data Type</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Correct Answers by Assigned User</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Number of Correct Answers</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Incorrect Answers by Assigned User</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Number of Incorrect Answers</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

View a quiz scorecard
You can view scorecards for a quiz record.
Role required: assessment_admin or admin

For detailed information about scorecards, see Quiz scorecards.

1. Navigate to Quizzes Quizzes.
2. Open a quiz record.
   The scorecard link is hidden if there are no quiz results to report.
4. The scorecard contains a header that displays the name of the quiz and a section that displays results or a comparison of ratings. You can select from these principal views:
   • Category Results
   • Question Results
   • Average Ratings
   • History

Quiz scorecards
The Quizzes application prepares printable scorecards.
A scorecard analyzes category and question responses and compares current ratings with previous ratings. You can examine ratings over time, compare question ratings, or compare the ratings of all categories. All ratings are averages for the time range selected.

The system dynamically updates a scorecard each time you view it, so the ratings reflect recently completed quizzes.

**Category results**
The Category Results view is a stacked bar chart of responses to all questions in a category.

Select the category to display from the choice list above the chart. Category results are only calculated for *scored questions*.

This view displays responses that use the following *data types*:

- Checkbox
- Choice
- Likert Scale
- Number
- Template
- Yes/No

**Note:** The Checkbox and Yes/No data types are combined into the Boolean data type in the *Quiz designer*. 

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Figure 442: Quiz category results
To view details about a specific response to a question, point to the colored segment representing a specific response. The chart displays the count for those responses and the percentage it represents of the total responses to that question.

Figure 443: Quiz category result details

Question results
The Question Results view shows the results for all questions in a quiz.
Select a question by name from the choice list to display the results in a pie chart or a bar chart, based on the data type.

Pie chart
The pie chart shows question results for these data types:
- Checkbox
- Choice
- Likert Scale
- Number
- Template
- Yes/No

Note: The Checkbox and Yes/No data types are combined into the Boolean data type in the Quiz designer
Figure 444: Quiz scorecard question results - pie chart
Bar chart

A bar chart appears when question results use this data type:

- Percentage

By default, all results for percentage questions use a report range of 20% segments. To configure a report range, navigate to Reports Administration Report Ranges.

Average ratings

The Average Ratings view displays a bar chart of the weighted average rating for each question in a category.

Use this view to learn how individual questions affect the overall rating for the category. Select a category from the second choice list above the chart. Ratings are only calculated for scored questions.
Figure 445: Average Ratings view

To view the effect of each question's ratings on the entire category's ratings, point to the colored bar. The pop-up box shows the percentage of the total ratings represented by each individual question's weighted average.
Scorecard history

The History view compares the current ratings for the categories and their questions with ratings from the previous three years or four quarters.

Ratings that have declined are highlighted in red and display negative numbers. Ratings that have improved are highlighted in green with positive numbers. Arrow icons beside the values in the Diff column indicate the trend of the current ratings against the previous ratings. Ratings are only calculated for scored questions.

Point to a category to display a line chart that shows the rating trend for that category. Click a category to view the Metric Category form containing the questions.

- 3 Years: To calculate the current ratings, the system averages the ratings from the trailing twelve month (TTM) period. The Diff column shows the discrepancy between the current ratings and the previous calendar year's ratings.
Figure 448: Scorecard history - 3 years

- 4 Quarters: Quarterly quizzes compare the average rating for each question and category in the current quarter against the average ratings from the previous four quarters. The Diff column shows the discrepancy between the current ratings and the previous quarter's ratings. The column labels count backward, by quarter from the current quarter. For example, if the current quarter is the 3rd quarter of 2013, then the previous quarters appear as 2nd [2013], 1st [2013], 4th [2012], and 3rd [2012]. All four of the previous quarters appear, whether or not there was any data for those quarters.
View an assessment category result

Category results contain values that represent an evaluated record's performance in a specific metric category. Each category result record stores data from one assessment group. Category result values are calculated based on category and metric weights and from metric result values for the same category.

Role required: assessment_admin or admin

---

**Note:** The system does not include metric results from certain responses in category result calculations. To compensate, the system adjusts the weight of the other normalized metric result values within the same category.

1. Navigate to Assessments Results Category Results.
2. Click the reference icon (ildo) next to an assessment group number to open the category result record.
3. View the Assessment Category Result form. All fields on the form are read-only.

Table 1037: Assessment Category Result form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
<td>Name of the metric category that the category result values apply to.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Rating</td>
<td>Rating is used on scorecards and decision matrixes. Rating is updated dynamically as users complete assessments. Rating is calculated as:</td>
</tr>
<tr>
<td></td>
<td>(Sum of all normalized values that share a particular assessment group, category, and assessable record) / (Number of assessment instances for the assessment group)</td>
</tr>
<tr>
<td></td>
<td>For example: In the Assessment Category Results table example, the assessment group ASG0000801 with category Politeness from group NY DB (the assessable record) has a Rating value 8.86.</td>
</tr>
<tr>
<td></td>
<td>On the associated Metric Results table, you can see that there are 4 instances of this group: AINST0000801, AINST0000802, AINST0000803, and AINST0000804.</td>
</tr>
<tr>
<td></td>
<td>The system calculated the rating using (5.14+5.14+1.43+5.71+5.14+4.29+4.29+4.29) / 4 = 8.86</td>
</tr>
</tbody>
</table>
### Field Description

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment group</td>
<td>Assessment group to which the category result is associated. The category result Rating and Normalized value are calculated from metric results in this assessment group only.</td>
</tr>
</tbody>
</table>
| Normalized value    | Calculated value that measures the Rating relative to the weights of categories used to assess the record evaluated. The normalized value is calculated as follows: 

\[
\text{Normalized value} = \text{Rating} \times \left( \frac{\text{Associated category weight}}{\text{Sum of weights of all categories the source record has category results for in this assessment group}} \right)
\]

Example: A source record has four associated category results in assessment group ASG0000907, one for each of these categories:

- Importance Rating (weight = 10)  
- Product Reliability (weight = 9)  
- Company Alignment (weight = 9)  
- Compliance Score (weight = 9)  

If this source record's category result for Product Reliability has a Rating of 7.81, the normalized value calculation is: 

\[
7.81 \times \left[ \frac{9}{(10+9+9+9)} \right] = 1.9
\]

<table>
<thead>
<tr>
<th>Weight</th>
<th>Weight of the associated category. You may need to configure the form to see this field.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
<td>Record evaluated as the assessment subject. You may need to configure the form to see this field.</td>
</tr>
</tbody>
</table>

### Create a decision matrix

The name and labels on a decision matrix are closely linked to the categories you choose for the axes. For that reason, first select the metric type and define the X and Y axes before you fill in other fields on the Decision Matrix form.

Role required: assessment_admin or admin

1. Navigate to Assessments Admin Decision Matrixes.
2. Click New and then select the metric Type to plot results for.
3. Right-click the form header and select Save. The X Axis and Y Axis related lists appear.
4. Define which metric categories the axes represent. Each axis can represent a single category or multiple categories. You must specify at least one category per axis in order for the decision matrix to render properly.
The available categories are limited to those associated to the metric type selected. To avoid confusion, always update the text for the axis and quadrant labels after editing or adding metric categories to an axis.

Figure 450: Decision matrix axes

5. Fill in the remaining fields on the Decision Matrix form (see table) and save the record.
## Decision Matrix

**Name:** Importance vs User Satisfaction  
**Type:** Vendor  
**Quadrant Design**
- **Quadrant label color:** #333333  
- **X-Axis label:** Importance  
- **Y-Axis label:** User Satisfaction  
- **Plotted item color:** #666666  
- **Highlight item color:** Purple  
- **Top left label:** Low importance, high satisfaction  
- **Top right label:** High importance, high satisfaction  
- **Bottom left label:** Low importance, low satisfaction  
- **Bottom right label:** High importance, low satisfaction

**Related Links**
- View Matrix

### X Axis
- Go to Metric X category...

### Y Axis
- Go to Metric Y category...
Table 1038: Decision Matrix form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the decision matrix, which appears as the title on the decision matrix page. It is recommended to include the axis categories in the name. For example, if you selected Importance Rating as the X-axis and User Satisfaction as the Y-axis, you might name the matrix Importance vs. User Satisfaction.</td>
</tr>
<tr>
<td>Type</td>
<td>Metric type associated with this decision matrix. Only results for assessable records of the selected metric type are plotted on the decision matrix.</td>
</tr>
<tr>
<td>Default</td>
<td>Determines whether or not this is the default decision matrix. The default decision matrix opens when you click View Matrix on a scorecard. Select the check box to set the matrix as the default decision matrix. The system prevents you from creating more than one default decision matrix per metric type. If there is already a default decision matrix for the type and you try to save a different matrix with the check box selected, an error message appears. The maximum values for the default decision matrix are controlled by the Maximum number of items to show for a decision matrix field filter property (com.snc.assessment.decision_matrix_filter_max_entries), which has a default value of 1000.</td>
</tr>
<tr>
<td>Quadrant Design Section</td>
<td></td>
</tr>
<tr>
<td>Quadrant label color</td>
<td>Color of the label text for the quadrants. Each quadrant label displays in the center of the quadrant. You can enter an HTML color name or hex value for this and the other color fields.</td>
</tr>
<tr>
<td>X-Axis label</td>
<td>Label text for the X-axis of the decision matrix. It is recommended to include the metric category name in the label text. For example, for an X-axis category of Importance Rating, the X-axis label is Importance.</td>
</tr>
<tr>
<td>Plotted item color</td>
<td>Color used to display plotted items.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Top left label</td>
<td>Label text for the top left quadrant. For an X-axis labeled Importance and Y-axis labeled Support, you might label the top left quadrant Low importance, high support.</td>
</tr>
<tr>
<td>Top left color</td>
<td>Fill color for the top left quadrant.</td>
</tr>
<tr>
<td>Bottom left label</td>
<td>Label text for the bottom left quadrant.</td>
</tr>
<tr>
<td>Bottom left color</td>
<td>Fill color for the bottom left quadrant.</td>
</tr>
<tr>
<td>Bottom right label</td>
<td>Label text for the bottom right quadrant.</td>
</tr>
<tr>
<td>Bottom right color</td>
<td>Fill color for the bottom right quadrant.</td>
</tr>
<tr>
<td>Y-Axis label</td>
<td>Label text for the Y-axis of the decision matrix.</td>
</tr>
<tr>
<td>Highlight item color</td>
<td>Color of highlighted plotted items. When you view a decision matrix from an assessable record's scorecard, the assessable record plotted item appears in the highlight color. Specify a highlight color that is different than the Plotted item color.</td>
</tr>
<tr>
<td>Top right label</td>
<td>Label text for the top right quadrant.</td>
</tr>
<tr>
<td>Top right color</td>
<td>Fill color for the top right quadrant.</td>
</tr>
<tr>
<td>Bottom right label</td>
<td>Label text for the bottom right quadrant.</td>
</tr>
<tr>
<td>Bottom right color</td>
<td>Fill color for the bottom right quadrant.</td>
</tr>
<tr>
<td>Related Lists</td>
<td></td>
</tr>
<tr>
<td>X Axis</td>
<td>Lists categories that define the X-axis of the decision matrix.</td>
</tr>
<tr>
<td>Y Axis</td>
<td>Lists categories that define the Y-axis of the decision matrix.</td>
</tr>
</tbody>
</table>
**Decision matrixes**

Assessment results obtained by questionnaires and scripted metrics can be mapped to decision matrixes. Assessment administrators can view and create these dynamically updated graphs, which make it possible to compare assessable records by category. Decision matrixes display data from a trailing twelve month (TTM) period.

---

**Note:** Assessment administrators can access decision matrixes through the Assessment application and vendor managers can access them through the *Vendor Performance* application.

---

**Decision matrix components**

The decision matrix page has these components:

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Options</td>
<td>Select the subset of assessable records you want to view. The filter options available vary by metric type, based on the Filter field and Filter condition field settings for each type. The maximum values in the filter are controlled by the Maximum number of items to show for a decision matrix field filter property (com.snc.assessment.decision_matrix_filter_max_entries), which has a default value of 1000.</td>
</tr>
<tr>
<td>Filter</td>
<td>Select the scale for the decision matrix. The greater the scale, the larger the decision matrix appears.</td>
</tr>
<tr>
<td>X- and Y-axes</td>
<td>Each axis represents one or more metric categories. If multiple categories are used for an axis, their respective weights determine the positioning of the plotted items.</td>
</tr>
<tr>
<td>Component</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Plotted items</td>
<td>The labeled points you see on a decision matrix, called plotted items, represent averages of category result data for assessable records. Point to a plotted item label to view a rating summary for that assessable record. Click a plotted item label to view the scorecard for the assessable record.</td>
</tr>
</tbody>
</table>
Plotted item rating summaries

If you point to a plotted item label on a decision matrix, a rating summary appears. The summary displays the assessable record's average ratings for each axis. If an axis represents one metric category, the ratings are calculated averages from results for that category. If an axis represents multiple categories, the ratings are calculated averages from weighted results for all of the categories.

The summary shows:

- Current rating
- Difference between the current rating and the rating from the previous year
- Ratings from each previous year, going back three years

Figure 451: Decision matrix rating summary

Take an assessment

Assessments that are assigned to you appear in your assessment and survey queue as a card that displays the assessment name, state, due date, and the associated incident number. Click Take Survey when you are ready.

Role required: none
Overdue surveys and assessments are marked with a red icon and red due date. You must answer every required question, indicated by a red bar, before you can submit the assessment as complete. If you start to take an assessment but cannot complete it, save your responses and return to it later. When you have answered all the questions and are satisfied with the responses, submit the assessment.

By default, you cannot modify your answers to an assessment after submission. However, if the administrator has configured an assessment to allow retakes, you can edit your answers and resubmit the questionnaire. Completed assessments configured for retake remain in the queue until their due date and display the Modify Assessment button on the card.

1. Navigate to Self-Service My Assessments & Surveys.

   **Note:** Users with the assessment Admin role can display other users’ assessments and surveys in addition to their own. Use the Show all and Show assigned to me related links to show and hide assessments and surveys. Click a card assigned to another user to open the associated metric type or survey definition.

2. On the assessment card, note the due date.

   **Note:** Depending on the configuration, you may receive email notifications to remind you of the due date.

3. Click Take Assessment to open the questionnaire.

   Assessment questionnaires are arranged in sections: first by record, then by category. Each record appears as a section title. Questions for the record appear below, grouped by category. Each category appears as a subsection below the record name. Click the collapse icon (:hidden) or expand icon (:[hidden]) to hide or show the questions in a category, or all the categories and questions for a record. Colored bars indicate the status of each question.
4. Answer each question to the best of your ability. Point to a question for more information.

If you are unsure of how to respond to a question or if a question does not apply to a particular record, select Not Applicable, if available.

5. Read any assertions present at the end of the assessment and acknowledge with a signature, if required.

A signature can require you to select a check box or authenticate your full name, which the system displays in a read-only field. You cannot submit your answers to the assessment until you provide the required signature.
6. Save or submit the assessment.
   - Save: Saves your responses without submitting them. You can close the questionnaire and access it later from your queue.
   - Submit: Submits the completed assessment when you are finished.

7. If prompted, enter your user name and password to verify your full name signature.
   If all the questions are answered with valid values, a success message appears. If the system detects an unanswered mandatory question or invalid response, the assessment is not submitted, and a message appears at the top of the questionnaire explaining the error. Questions with problems are temporarily highlighted.

8. You can modify your responses to the assessment until its due date. To update your answers and resubmit an assessment that permits retakes, click Modify Assessment.
Assessment questionnaires

In the assessment process, users complete assessment questionnaires on topics of interest to provide subjective data for future business decisions.

No special role is required to complete an assessment. You are eligible to complete assessments that are assigned to you. For example, you might be expected to evaluate vendors your organization works with, based on traits related to customer service. The system stores your responses so decision makers can compare the performance of the items you evaluate. You and your manager may receive email notifications as reminders of important assessment information.

Metric types and assessable records

In the Assessments application, assessment administrators create and administer metric types and assessable records.

A metric type defines a set of records an organization wants to evaluate, such as vendors, projects, or employees. For each type, the system generates unique assessable records that link the type to records that need to be evaluated, such as the individual records for the vendors Amazon and Intel. There may be multiple assessable records for the same source record if the source record meets the criteria for more than one type. For example, you might want to evaluate a record on the Company table, such as Intel, as a vendor and as a manufacturer, with different categories and metrics.

For configuration suggestions, see Assessment administrator tasks on page 2259.

Assessable records

An assessable record links a source record you want to evaluate, such as the company record for Amazon or the user record for a sales representative, to a metric type, such as vendors or employees.

You use assessments to evaluate the assessable record. The system generates assessable records from the source records that match the table and conditions set on the Assessment Metric Type form. You evaluate the assessable records with metric categories and metrics, which define traits and values to assess. For metric types with the On demand schedule type, you can generate on-demand assessments from the Assessable Record form. This method of assessment generation makes it easy to create and preview short questionnaires or to quickly obtain assessment results for specific assessable records.

You can set up an assessment description that includes information from multiple fields on an assessable record and is displayed on multiple lines. This set up provides the user who is taking the assessment with a more detailed and understandable description of the information being requested on the assessment questionnaire. Create a multi-line description using table titles, which can be defined to use one or more fields from the selected table. See Define a new smartphone table title for more information.

Delete an assessable record

When you delete an assessable record, the system deletes any stakeholders for the record.

Role required: assessment_admin or admin

Note: If a source record is deleted, the system deletes the associated assessable record. To delete the source record, you must first delete all associated metric results and category results.

Delete the assessable record:

- To delete a single record, open the record and click Delete.
- To delete multiple records, use the Assessable Records list.
View an assessable record

View the Assessable Record form to edit preferences and perform various actions.

Role required: assessment_admin or admin

1. Navigate to Assessments Assessable Records.
2. Open a record from the list.
   By default, the list displays only assessable records with Active metric types.
3. On the Assessable Record form, edit fields and perform other actions as necessary (see table).

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>[Read-Only] Assessable record name based on the display value of the source record. The name appears on assessment questionnaires.</td>
</tr>
<tr>
<td>Source</td>
<td>[Read-Only] Source record the assessable record is linked to. The Source reflects the table name and source record display value. For example, if the Name field is the display value for the Company table, the assessable record for a company record named Amazon has the Source value Company: Amazon.</td>
</tr>
<tr>
<td>Live feed</td>
<td>Check box that, when selected, creates a live feed group for the assessable record, which appears on the scorecard. If you clear the check box after a live feed group has been created, the system deletes the live feed group and all its messages.</td>
</tr>
<tr>
<td>Type</td>
<td>[Read-Only] Metric type from which the assessable record was generated.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Decision matrix</td>
<td>Check box that, when selected, enables this assessable record's results data to appear on decision matrixes of the same metric type. Decision matrixes are graphs that plot the assessment results for multiple assessable records. If you clear the check box, the assessable record still appears on the default decision matrixes if you click the View Matrix related link on the assessable record's scorecard.</td>
</tr>
<tr>
<td>Live feed group</td>
<td>[Read-Only] Live feed group for this assessable record. When you select the Live feed check box and save the record, the system populates this field.</td>
</tr>
</tbody>
</table>

**Related Links**

- **View Scorecard**: Opens the scorecard for the assessable record.

**Related Lists**

- **Category**: All metric categories associated with the assessable record. An assessable record must be associated to a category to be evaluated. Click Edit to add or remove category associations. Note that it is often more efficient to associate assessable records to categories using the Metric Category form.

- **Category users**: All stakeholders who can take assessment questionnaires about this assessable record. Click Edit to create and delete stakeholders. For more information about this and other methods of creating stakeholders, see [Stakeholders](#).

Domain separation and Assessments

This is an overview of domain separation and Assessments. Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.

**Overview**

Support: Level 2
Domain separation is supported in this application. Not all ServiceNow applications support domain separation; some include limitations on the data and administrative settings that can be domain separated. To learn more, see Application support for domain separation.

As an assessment creator, assessment_admin can create or edit an assessment in their assigned domain. A Global domain assessment_admin can create or edit assessment in any domain.

As an assessment taker, a user in a particular domain can see assessable records in the Global domain, in the user's domain, and in any child domains. Users in the Global domain can see all assessable records.

**How domain separation works in Assessments**

If the metric type is global:

- All the categories and metric should be Global
- Assessable records can be from different domains
- When the assessment is assigned to a user, then:
  - Users in the Global domain can see all assessable records
  - Users in a particular domain can see assessable records in the Global domain, in their domain, and in any child domains
  - If the user does not have access to any of the assessable records (for example, the metric type is Global, but all assessable records are in Acme domain and a user in the XYZ domain is assigned the assessment), the assessment instance is not created and an "Instance could not be created" error message occurs.

If the metric type is not Global:

- All categories and metrics must be in the same domain as the metric type
- All assessable records must be in the same domain as the metric type
- You can assign assessments to users that are in the Global domain, in the domain of the metric type, or in any parent of the domain of the metric type

**Approvals**

Approvals can be defined for all tasks and allow users or groups to be associated with a task, for the purpose of either approving or rejecting that task. Approvals are defined by navigating to System Policy Approvals.

The following information defines an approval:

<table>
<thead>
<tr>
<th>Field</th>
<th>Input value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approver</td>
<td>A reference to the user who is responsible for approving the related record.</td>
</tr>
</tbody>
</table>
Approval engines

The differences in the way that companies handle their approvals, as well as the differences between approvals for the various applications (such as Service Catalog Requests and Change Management), calls for supporting flexibility in setting up approvals within applications. This flexibility is provided through the selection of an "approval engine" that is used to manage the approvals for each of the Task tables (that is, all tables that extend the Task table).

There are three different approval engine options available for each Task table.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approval Rules</td>
<td>A simple set of rules that are evaluated until one matches for the Task table. The matching approval rule is used to create the users that are to approve the task. Set up approval rules by navigating to System Policy Approvals.</td>
</tr>
<tr>
<td>Process Guides</td>
<td>A sequence of approval steps over which you may control how approvals and rejections are handled. This option is deprecated and should not be used.</td>
</tr>
<tr>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Turn off Engines</td>
<td>Turn off both approval engines for this Task table. This option should be selected and is made read-only when a workflow is used to manage the approval process for the table.</td>
</tr>
<tr>
<td></td>
<td><strong>Caution:</strong> Not turning off the approval engines might have a performance or behavioral impact on your instance.</td>
</tr>
</tbody>
</table>

Set up an approval engine

To manage the approvals for each of the Task tables in the system, set up an approval engine.

1. Navigate to **System Properties Approval Engines**.

   The following page appears with the Approval Engine option for each Task table in the system. If the Approval Engine option is greyed out and shows Turn engines off, read the Notes in the same row. The most common reason an approval engine is turned off is that a workflow is managing the approvals on the table. Having the approval engine turned off prevents conflicts with the workflow that could cause a range of issues. If you want to use an approval engine on the table, set the workflow to inactive.
2. Select the *approval engine option* for each Task table from the choice list.

3. Click Save.
   These preferences are saved as system properties that are named `glide.approval_engine.<table_name>`. 
**Approval rules**

Many organizations rely on an approval process to ensure that requests are reasonable and fit an organization’s budget.

The service catalog can use these classes of approvals:

<table>
<thead>
<tr>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gating approvals</td>
<td>Must occur before a request can be initiated. For example, allow a manager to reject an employee’s request for a company car.</td>
</tr>
<tr>
<td>Process approvals</td>
<td>Take place within an execution plan process that has been initiated. For example, allow the security group to reject a request for access to SSN even though the employee’s manager approved it.</td>
</tr>
</tbody>
</table>

**Note:** To enable approval processes to operate smoothly, make sure that the appropriate users have the correct role, and that the role grants access to the necessary tables for users in all the relevant departments and domains.

**Set automatic approval rules**

Approval rules can automatically set the approval state to something other than Not yet requested. As a result, an approval rule can create a set of approvers. You can also start the approval process by setting the approval state to Requested.

**Prerequisites**

Role required: admin

Approval rules have two new fields:

- Run rule before: If true, the approval rule runs before the record is inserted/updated.
- Set State: If this rule applies, then the task record’s approval state is automatically set to this value.

**Note:** The Set State field only behaves as expected if the Run rule before check box is enabled.

- In the example below, this rule automatically sets the state of the task to Approved thereby auto-approving the task.
Gating approvals

A gating approval acts as a gate through which a request must pass before it can start. Until all gating approvals are met, no notifications go out, no tasks get sent to technicians, and nobody starts working on the request in question.

Generate gating approvals with:

**Table 1043: Gating approvals**

<table>
<thead>
<tr>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approval rules</td>
<td>Can apply to the service catalog as well as any other task table.</td>
</tr>
<tr>
<td>Item-based approvals</td>
<td>Flag specific catalog items as requiring specific approvals. Any requests for these items automatically require these approvals.</td>
</tr>
</tbody>
</table>

*Set up a gating approval via an approval rule*

You can set up a gating approval via an approval rule.

Role required: admin

1. From the left navigation pane, select System Policy Approval Rules.
2. Click New.
### Table 1044: Approval rules

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name</strong></td>
<td>Name of this rule.</td>
</tr>
<tr>
<td><strong>Table</strong></td>
<td>Task table to which this rule applies. For most service catalog approvals, select Request.</td>
</tr>
<tr>
<td><strong>Active</strong></td>
<td>Indicator of whether the rule is active (defaults to true).</td>
</tr>
<tr>
<td><strong>Run Rule Before</strong></td>
<td>Indicator of whether the rule runs before or after the request record is saved. For most approvals, select this check box.</td>
</tr>
<tr>
<td><strong>User</strong></td>
<td>User who must approve this request (can be empty).</td>
</tr>
<tr>
<td><strong>Group</strong></td>
<td>Group that must approve this request (can be empty).</td>
</tr>
<tr>
<td><strong>Set State</strong></td>
<td>Value of the approval field on the task in after this rule runs. In most cases, select Requested.</td>
</tr>
<tr>
<td><strong>Condition</strong></td>
<td>Condition under which the rule applies.</td>
</tr>
<tr>
<td><strong>Script</strong></td>
<td>An optional server script to programmatically specify who the approver should be. For example, for the one-line script current.requested_for.manager, ServiceNow checks the requested_for reference field on the current record. It then locates the manager field on the referenced record and assigns that person as the approver. For other examples, see the Script field on approval rules provided by ServiceNow.</td>
</tr>
</tbody>
</table>

**Note:** The list shows only tables and database views that are in the same scope as the approval rule.

**Notes and limitations:**

1. You can have as many rules as you want on a given table. If more than one rule applies, you'll get more than one approver.
2. You can't get duplicate approvers, for example, if two rules both want Fred Luddy to approve a particular request, the system will only create one approval entry for him.
3. By default all requests start out in a Not yet requested approval state. Approval notifications will not go out until the request's approval state is set to Requested. You can do that manually, or you can do it in script, but the easiest way to do it is to use the Set State field to automatically set the request to Requested.
Set up a gating approval based on the item being ordered
In addition to adding approvals via approval rules, you can also add approvals based on what kind of item is being ordered.

In addition to adding approvals via approval rules, you can also add approvals based on what kind of item is being ordered. We can, for example, specify that all Blackberrys need to be approved by David Loo.

To do so, navigate to the item in question and scroll to the related list of required approvers. There are two lists:

- Approved By Group: A list of groups that have to approve requests for this item
- Approved By: A list of users who have to approve requests for this item

![Figure 453: Approve list](image)

In the example above, this request must be approved by all members of the Hardware group and by David Loo.

Notes and limitations:

1. As with approval rules, you are protected against duplicate entries. Thus if David Loo is a member of the hardware group, as well as being a standalone approver, he will only get one approval request.
2. Item-based approved work in addition to rather than instead of approval rules so you can (and probably will) use both.

Process approvals

Once a request has passed its gating approvals, any relevant execution plans are initiated.

Those plans, in turn, create a sequence of required tasks. You can add an approval step to an execution plan, which is configured to occur at the appropriate point.

From the left navigation pane, select Service Catalog Execution Plans, and then select the plan to which to add an approval step. Then click the New Approval button.
The Approval Task screen appears. Just like a regular Service Catalog execution task, an approval execution task has:

- Name: The name of this task
- Order: Sequence of this task within the plan
- SLA: SLA to which this task applies
- Delivery Time: Time allowed for the completion of this task

After you create the task, right click the title bar and select Save. Two related lists appear at the bottom of the screen:

- Approved By Group: A list of groups that must approve the request before this task is complete
- Approved By: A list of users who must approve the request before this task is complete
### Figure 455: Approval task

In the example above, this security approval task must be approved by Fred Luddy.

**Note:** When an in-process approval is rejected, that particular line item is canceled as well, but the request itself isn't necessarily canceled. Thus if one ordered a blackberry and a laptop, and the blackberry was rejected, the laptop request would continue being processed.

### Approve with a process guide

Process guides work similarly to approval rules in that their execution is controlled via a condition. The default version of approval tasks allows you to specify that the approval in question be approved by:

1. One or more specific people
2. One or more groups of people

You can optionally use Process Guides instead of approval tasks. Process guides are more flexible in that they allow for:
1. "Any of" or "All of" approvals
2. Sequenced approvals

You can link a process guide to an execution task.
1. From the left navigation pane, select System Policy Process Guides.
2. Create a new guide.
3. Set the table to Catalog task.
4. Fill in a condition under which this guide should attach.

Example #1: Apply to all "Capacity Review" tasks.

```
Add Condition

- + State is Open
  - + and Delivery task is Capacity Review
```

Example #2: Apply to all "Capacity Review" tasks where the requester is in Atlanta.

```
Add Condition

- + State is Open
  - + and Delivery task is Capacity Review
  - + and Request item.Request.Requested for Location is Atlanta
```

Process guide tips and tricks:

1. All catalog tasks are generated when a request is first submitted, but tasks which aren’t active yet have a state of “pending”. So if you do not want to send out approval requests until a task has actually started, add "state=open" as part of your condition.
2. There is a "Default" process guide in the system for catalog tasks with a sequence number of 10,000. It behaves exactly the same way the old, pre-process guide code did in regards to approvals. Approvals are based on the execution of task-related lists.

Schematic of a hypothetical approval process

In the diagram below of a hypothetical approval process, the gating approval is color coded blue and an in-process approval is orange.
The approval summarizer formatter creates the summary at the bottom of an approval form. The approval summarizer displays different information depending on what is being approved, such as a change request or a service catalog request. Following are two examples.
figure 457: summary of a change request

<table>
<thead>
<tr>
<th>Summary of item being approved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change Request</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number</th>
<th>CHG0000001</th>
<th>Requested by</th>
<th>David Loo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affected CI</td>
<td>Sales Force Automation</td>
<td>Type</td>
<td>Normal</td>
</tr>
<tr>
<td>Planned start date</td>
<td>2016-07-27 16:00:00</td>
<td>Risk</td>
<td>High</td>
</tr>
<tr>
<td>Planned end date</td>
<td>2016-07-27 18:00:00</td>
<td>Impact</td>
<td>3 - Low</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Short description</th>
<th>Rollback Oracle Version</th>
</tr>
</thead>
</table>

| Description | Performance of the Siebel SFA software has been severely degraded since the upgrade performed this weekend. We moved to an unsupported Oracle DB version. Need to rollback the Oracle instance to a supported version. |
The Deny button allows the approver to deny one or more requested items in a multi-item request, before approving the overall request. If a requested item is denied, the workflow for that item never starts. The approver can then choose to Accept the item.

**Note:** When the overall request is approved, you must ensure this Deny button is hidden. If this button is used after request approval, the requested item workflow is canceled, leaving the stage in an inconsistent state. Similarly, the Accept button on requested items should only appear before the overall request is approved or rejected.

### Summarizers

Approval summarizers are stored in the Macro [sys_ui_macro] table.

From the left navigation pane, select System UI UI Macros. Summarizers use a naming convention of approval_summarizer_ + '<table_name>' (for example, approval_summarizer_change_request is the summarizer for change requests, while approval_summarizer_sc_request is the summarizer for service catalog requests).

Each summarizer is written in Jelly script, which is used to define internal forms. The script is stored in the large XML field at the bottom of the UI Macro form.

**Change a summarizer**

You can modify existing approval summaries to include additional information.

These are advanced customizations that might not be appropriate for all implementations, and require creating a custom form.

1. Navigate to System UI UI Macros.
2. Open the summarizer you want to change.
3. Copy the script to another location before editing, in case you need to revert it.
4. Modify the script.
5. Click Update.

Create a new custom summarizer
After you add a new table that has approvals to an instance, you can add a custom summarizer by creating a new UI macro.

approval_summarizer can only be used on approval forms in the global scope.

1. Navigate to System UI UI Macros
2. Click New.
3. Give the macro a name that follows the summarizer naming convention: approval_summarizer_<tablename>
4. Complete the rest of the form and click Submit.
5. Add the custom summarizer to the appropriate form.

Approval with e-signature
Approval with e-signature allows users to approve requests by re-entering their login credentials.

Approval with e-signature supports the following authentication credentials:

- User name and password matching a user in the local database.
- User name and password matching a user authorized by an external identity provider as part of a SAML 2.0 single sign-on integration.

Activate Approval with e-Signature plugin

The Approval with e-Signature plugin (com.glide.e_signature_approvals) allows users to approve requests by re-entering their login credentials.

Role required: admin

1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.
   - If the plugin depends on other plugins, these plugins are listed along with their activation status.
   - If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).
4. If available, select the Load demo data check box.
   - Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.
   - You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.
5. Click Activate.

De-activate e-signatures

Use this procedure to de-activate e-signatures.

Although plugins cannot be removed, e-signatures can be disabled.

1. Navigate to System Definition E-Signature Registry.
2. Set Enabled to False on any tables where e-signatures are no longer required.

Use e-signature approvals

Users can approve requests with an e-signature.

Users can approve requests with an e-signature by:

- Selecting the Approve or Reject option on a list context menu.
- Clicking the Approve or Reject button on a form.
- Changing a request record's State to Approved in either the list-editor or form.

Selecting any of these options presents the user with an Approver Authentication window, which requests the user's credentials again.

Installed with approval with e-signature

Installing approval with e-signature installs certain properties.

- Module - E-Signature Registry
- UI Action - Approve (on table sysapproval_approver, with no action name)
- UI Action - Approve (on table sysapproval_approver, with no action name)
- UI Action - Approve (on table sysapproval_approver, with the action name authenticated_list_approval)
- UI Page - form_login_validate_dialog
- UI Page - login_validate_dialog
- UI page: saml2_esignature_login, the re-authentication page that appears when an approver tries to approve a request.
- Properties: see E-signature SAML properties
- Client Script - Authenticate Approver
- Script Include - User
- Script Include - UserAuthentication
- Processor: eSigSaml2AssertionConsumer

Installing the plugin also disables the two out-of-the-box Approve UI Actions on the sysapproval_approver table.

Select an approval table

By default, activating the Approval with E-signature plugin enables e-signature for all tables for which a previous approval exists.

E-signature approvals can also be enabled on a table-by-table basis. To enable e-signatures for a table:

1. Navigate to System Definition E-Signature Registry .
2. In Table name, use the drop-down list to select a specific table.

### Table 1045: Table Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Input Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table</td>
<td>A table drop-down to select the table that requires e-signatures.</td>
</tr>
<tr>
<td>Enabled</td>
<td>If selected, e-signature is required. Clear this option to remove the e-signature requirement.</td>
</tr>
</tbody>
</table>
Set up an approval from a local database

Enable users to authorize e-signature approvals using local database credentials.

1. Activate the Approval with e-signatures plugin.
2. Create user records for approval users.

Use Multi-Provider SSO to set up an SSO approval for a SAML 2.0 authentication

An SSO approval with e-signature requires configuration on the SAML IdP and the ServiceNow instance. The SAML IdP must support and honor the forceAuthn attribute in SAML assertion requests. E-signature does not function without this IdP setting. To set up an approval with e-signature using credentials from a SAML 2.0 authentication:

1. Activate or upgrade to SAML 2.0 with the Integration - Multiple Provider Single Sign-On Installer plugin.
2. Activate the Approval with E-Signature plugin.
3. Navigate to Multi-Provider SSO Identity Providers and verify your 2.0 SAML IdP configuration Advanced tab shows the Force AuthnRequest attribute checked.
   Your SAML 2.0 IdP must support the Force AuthnRequest attribute, or e-signature is not supported.
4. On the eSignature Approval tab, enter the following e-signature SAML properties:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assertion Consumer URL for eSignature authentication</strong></td>
<td>This property defaults to the appropriate URL. To configure this property, click the lock icon to make this field editable. After edits, click the icon to lock the field.</td>
</tr>
<tr>
<td><strong>Assertion Consumer Index for eSignature authentication</strong></td>
<td>If your Service Provider has more than one URL set for the AssertionConsumerURL, you can set the index to use for eSignature, starting with index 1 or more.</td>
</tr>
<tr>
<td><strong>AuthnRequest URL for eSignature Authentication</strong></td>
<td>You can enter the URL that points to the SAML 2.0 IdP AuthnRequest URL for eSignature authentication. If the URL is the same as the Assertion Consumer URL, you can leave this setting blank.</td>
</tr>
<tr>
<td><strong>Authentication Pop-up Dialog Width</strong></td>
<td>When a user approves a request using eSignature, a dialog opens and a user can enter credentials. This setting controls the width of that dialog box. The default is 500.</td>
</tr>
<tr>
<td><strong>Authentication Pop-up Dialog Height</strong></td>
<td>When a user approves a request using eSignature, a dialog opens and a user can enter credentials. This setting controls the height of that dialog box. The default is 300.</td>
</tr>
</tbody>
</table>
5. Click the Generate Metadata button underneath the tabs to regenerate the service provider metadata. Copy this data and update it on the SAML IdP.

Set up e-signature approvals

The setup required depends on where user credentials are stored.

See the section that matches the source of your user credentials:

- Setting up approvals from a local database
- E-signature SAML properties

**Note:** ADFS 2.0 does not support re-authentication requests that E-Signature requires.

Approval status

The approval status of a change request is determined by looking at the current status of all the approvers.

If any approver has rejected the change, the approval status will be Rejected. If all approvers have approved the change, the approval status will be Approved. If all approvers are in the Not Requested status or if there are no approvers, the change status will be Not Requested, otherwise the status will be Requested.

For added flexibility when creating approvals, including the ability to set up an “one of” approval where only one person of a group of approvers needs to approve, consider using **Workflows**.

Generate an approval using approval rules

The system can automatically generate an approval request to individuals or groups when specific criteria are met. The automatic generation of approval requests is driven using the System Policy feature.

In the sample below, a change opened in the category network is assigned to the System Administrator:
Figure 459: Approval Rules

When an approver is automatically added based on approval rules, the status of the approval automatically defaults to "Requested".

Generate approvals using the approvers related list

It is possible to manually add approvers to a request.

Additional approvers can be added by clicking the Edit button in the Approvers section near the bottom of a request. When an approver is added manually, the status for that approver defaults to Not Yet Requested. When the status of the approver changes to Requested, the approver is sent an email requesting approval action.

Generate approvals using workflows

Workflows are a powerful and flexible method of generating approvals. Use workflows to create group approvals and user approvals.

A variety of variables are available to fine-tune the approval process, including the actions that occur when approval or rejection take place. When a workflow activity generates an approval record, the system populates the Workflow activity field on the approval record with a reference to the activity. Do not use this field when creating business logic. For more information, see Approval and Rollback Activities.

Note: Conflicts can arise when the approval process for a table is managed by both the workflow engine and the approval engine. In general, if there is a workflow that manages the approval process for a table, the approval engine should be turned off for that table.

Multiple approvers

With multiple approvers, all approvers must authorize the request before the status will change to "Approved".

Should any approver reject the request, the status will immediately be set to "Rejected".

Receive notifications

Individuals who are designated approvers automatically receive approval notifications, including approval status updates.

Approval notifications will be sent at the following times:
• When an individual is assigned as an approver either automatically or manually. If a group is chosen, then all members of the group will be sent an email. By default, the email an approver receives will contain a "mailto" link that will allow the approver to either approve or reject the request directly from their email system.
• When the request reaches approved status, the person assigned to the request will receive an email indicating it has been approved.

The details contained in the emails and the points at which they are sent can be tailored using System Definition Business Rules and System Policy.

Note for Blackberry users: In order to see the "mailto" links mentioned above to approve or reject a request (i.e. 'Click here to approve CHG55555' or 'Click here to reject CHG55555'), your Blackberry device must be using version 4.5 of their software which supports HTML emails. If your Blackberry device is using an earlier version, you will not be able to view or use the "mailto" links. However, as a workaround, users can reply to the email and add the statements state:approved or state:rejected within the body of the email before sending it to force the automatic approval/rejection functionality.

If you create an appropriate Inbound Email Action, you can let approvers respond to approval email notifications with a simple "yes" or "no" answer.

Dynamic approval forms

When you are looking at an approval request, the form has a context-appropriate summary of the item to be approved.

For example, if you're looking at a Change Management approval request, you'll see details from the relevant change request. For a Service Catalog approval request, you'll get details of the request.

<table>
<thead>
<tr>
<th>Approval</th>
<th>Update</th>
<th>Approve</th>
<th>Reject</th>
<th>Delete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approver: Bow Ruggen</td>
<td>Approval for: CHG00001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State: Approved</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments:

Looks good

Summary of Item Under Review:

Rollback Oracle Version

Performance of the Siebel SFA software has been severely degraded since the upgrade performed this weekend. We moved to an unsupported Oracle DB version. Need to rollback the Oracle instance to a supported version.

Figure 460: Change request approval example
Scripts and engines execution order

Scripts, assignment rules, business rules, workflows, escalations, and engines all take effect in relation to a database operation, such as insert or update. In many cases, the order of these events is important.

**Note:** Client-based code that executes in the browser, using Ajax or running as JavaScript, will always execute before the form submission to the server.

The order of execution is as follows:

1. **Before** business rules: Scripts configured to execute before the database operation with an order less than 1000.

2. **Before** engines. The following are not executed in any specific order:
   - Approval engine (for task and sys_approval_approver tables)
   - Assignment rules engine (for task tables)
   - Data policy engine
   - Escalation engine
   - Field normalization engine
   - Role engine - keeps role changes in sync with sys_user_has_role table (for sys_user, sys_user_group, sys_user_grmember, and sys_user_role tables)
   - Execution plan engine (for task tables)
   - Update version engine - creates version entry when sys_update_xml entry is written (for sys_update_xml table)
   - Workflow engine (for default workflows)

3. **Before** business rules: Scripts configured to execute before the database operation with an order greater than or equal to 1000.
4. The database operation (insert, update, delete).

5. *After* business rules: Scripts configured to execute after the database operation with an order less than 1000.

6. *After* engines. The following are not executed in any specific order:
   - Label engine
   - Listener engine
   - Table notifications engine
   - Role engine - keeps role changes in sync with `sys_user_has_role` table (for `sys_user`, `sys_user_group`, `sys_user_grmember` and `sys_user_role` tables)
   - Text indexing engine
   - Update sync engine
   - Data lookup engine inserts or updates
   - Workflow engine (for deferred workflows)
   - Trigger engine (for all Flow Designer flows)

7. Email notifications. The following are executed based on the weight of the notification record:
   - Notifications sent on an insert, update, or delete
   - Event-based notifications

8. *After* business rules. Scripts configured to execute after the database operation with an order greater than or equal to 1000.

**Geolocation**

The geolocation feature uses Google Maps to track users, plan efficient routes between locations, and assist in finding accurate travel times for applications that require this information, such as Work Management.

The system locates users from latitude and longitude information provided by their mobile devices or browsers. Tracking the location of certain users can improve business processes such as the completion of work order tasks. For example, in work management geolocation, the system updates an agent's position each time that agent updates a task record. When the system updates an agent's location frequently, agents and dispatchers can use features like auto-routing to create efficient schedules.

Geolocation features can be configured by users with the admin role.

**Activate geolocation**

An administrator can activate the Geolocation plugin.

1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.
   - If the plugin depends on other plugins, these plugins are listed along with their activation status.
   - If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).
4. If available, select the Load demo data check box.
Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.

You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.

5. Click Activate.

Installed with geolocation

Several component types are installed with Geolocation.

Modified by Geolocation

The Geolocation plugin adds a field called *Geolocation tracked* to the User [sys_user] table. This field allows the system to track individual users by their geographical coordinates.

Business rules installed with geolocation

Business rules are added with activation of Geolocation.

<table>
<thead>
<tr>
<th>Name</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GeoLocation Data updated</td>
<td>User [sys_user]</td>
<td>Populates the Latitude and Longitude fields on the Geolocation History [geo_history] table when the Latitude and Longitude fields are updated on the User [sys_user] table.</td>
</tr>
</tbody>
</table>

Client scripts installed with geolocation

Client scripts are added with activation of Geolocation.

<table>
<thead>
<tr>
<th>Name</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Update Geolocation on Task</td>
<td>Task [task]</td>
<td>Populates the Latitude and Longitude fields on a user record with GPS coordinates when that user loads any record on the Task table or a table that extends Task. This occurs only when geolocation tracking is enabled for the user.</td>
</tr>
</tbody>
</table>

Properties installed with geolocation

Geolocation provides the following configurable properties in Geolocation Administration Geolocation Properties.

The Google Maps plugin provides additional *map properties* that are used to implement and control specific geolocation features. You must have a *private key* for Google Maps API for Business to take advantage of the properties listed here.
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.geolocation.allow.toll.roads</td>
<td>Allow toll roads to be used. Allows the system to use toll roads when auto-routing an agent's tasks.</td>
</tr>
<tr>
<td></td>
<td>• Type: True/false</td>
</tr>
<tr>
<td></td>
<td>• Default value: True</td>
</tr>
<tr>
<td>glide.geolocation.default.start.time</td>
<td>Default start time for all agents when no schedule is set. This value sets the start time for a day other than the current day, when no scheduled task exists or is continued from the previous day. This property uses a 24 hour clock.</td>
</tr>
<tr>
<td></td>
<td>• Type: String</td>
</tr>
<tr>
<td></td>
<td>• Default value: 08:00</td>
</tr>
<tr>
<td>glide.geolocation.evening.rush.hours</td>
<td>Evening rush hour span, formatted as 14:30-16:00. All times are expressed as a range, separated by a dash with no spaces. Times not using this format are ignored. This property must be used with the work.management.morning.rush.hours and work.management.rush.travel.buffer properties and uses a 24 hour clock.</td>
</tr>
<tr>
<td></td>
<td>• Type: String</td>
</tr>
<tr>
<td></td>
<td>• Default: 0</td>
</tr>
<tr>
<td>glide.geolocation.history.cleanup</td>
<td>Number of days to keep history data. ServiceNow keeps agent geolocation history records for the number of days specified by this value.</td>
</tr>
<tr>
<td></td>
<td>• Type: Integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 30</td>
</tr>
<tr>
<td>glide.geolocation.morning.rush.hours</td>
<td>Morning rush hour span, formatted as 06:30-08:00. This property uses a 24 hour clock. All times are expressed as a range, separated by a dash with no spaces. Times not using this format are ignored. This property must be used with the work.management.evening.rush.hours and work.management.rush.travel.buffer properties.</td>
</tr>
<tr>
<td></td>
<td>• Type: String</td>
</tr>
<tr>
<td></td>
<td>• Default: 0</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>glide.geolocation.proximity</td>
<td>Minimum distance an agent must move to be considered in a new location (in meters). This setting establishes a geolocation perimeter that prevents ServiceNow from creating unnecessary history records when an agent has multiple tasks in the same vicinity. An example of this might be when an agent has several tasks in one building. The system assumes that all task activity within the specified radius is part of a single record and does not create additional records when the agent moves from task to task around the building.</td>
</tr>
<tr>
<td></td>
<td>• Type: Integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 500</td>
</tr>
<tr>
<td>glide.geolocation.proximity.location</td>
<td>Maximum distance an agent can be from a specific location and still be placed at that location (in meters). This setting defines the maximum distance that an agent can be from a specified location and still be placed at that location by the system.</td>
</tr>
<tr>
<td></td>
<td>• Type: Integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 200</td>
</tr>
<tr>
<td>glide.geolocation.rush.travel.buffer</td>
<td>Percentage to add to all rush hour travel times. The system uses this percentage to calculate schedules when auto-routing an agent. Use this property when both morning and evening rush hour times are defined. An example of a valid time buffer percentage is 15.</td>
</tr>
<tr>
<td></td>
<td>• Type: Integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 0</td>
</tr>
<tr>
<td>glide.geolocation.tracking.frequency</td>
<td>Sets the length of the recurring interval, in seconds, that the system waits between attempts to update a user’s geographic coordinates. The system updates geographic coordinates only for users who have geolocation tracking enabled.</td>
</tr>
<tr>
<td></td>
<td>Minimum amount of time between updating the user’s location (in seconds). This setting defines how long the system waits before updating an agent's location, regardless of task activity or travel. This prevents ServiceNow from creating unnecessary history records if an agent in one location views a task multiple times.</td>
</tr>
<tr>
<td></td>
<td>• Type: Integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 300</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| glide.geolocation.travel.buffer | Percentage to add to all travel times. An example of a valid percentage value is 15.  
- Type: Integer  
- Default value: 0 |
| glide.geolocation.work.spacing | Amount of time (in minutes) to add between the end of a task and the travel start of the next. An example of a valid time value is 10.  
- Type: Integer  
- Default value: 0 |

Script includes installed with geolocation

Script includes are added with activation of Geolocation.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GeolocationAJAX</td>
<td>Utilities the system uses when making geolocation AJAX calls.</td>
</tr>
<tr>
<td>GeolocationUtils</td>
<td>Core utilities for geolocation functionality.</td>
</tr>
</tbody>
</table>

Geolocation Google key

Geolocation requires a Google Maps API for Business license to enable the use of Google driving time estimates and to use Google Maps. Applications, such as Field Service Management, have functionality that requires this license.

If you are using auto-routing or auto-dispatch in Field Service Management, both the Google Maps API for Business private key and the client ID must be set for precise time estimates. Without these values, driving times for auto-routing and auto-dispatch are not available, and a rough estimate or fixed time is used. Use these properties, found in System Properties Google Maps Google Maps, to enable the geolocation feature.

- Client ID for Google Maps API for Business: Google client ID for your organization. This ID is from Google and starts with gme-, such as gme-mycompanyname.
- Private key for Google Maps API for Business: Key required to get accurate driving time estimates from Google for some features of Geolocation. An example of an encoded key is: vNIXE0xscrmjlyV-12Nj_BvUPaw=

Geolocation history

The Geolocation History [geo_history] table contains the history of each tracked user’s location over time.

To view geolocation history, navigate to GeolocationGeolocation History. The record list shows time stamped location data for all users configured for geolocation tracking.
The following system properties, located in Geolocation Administration Geolocation Properties, control the data that appears in this table.

- Minimum distance an agent must move to be considered in a new location (in meters): Perimeter that defines a single location in which multiple tasks are present. This property prevents the system from creating unnecessary history records when multiple tasks are in the same general location.
- Maximum distance an agent can be from a specific location and still be placed at that location (in meters): Distance that a user can be from a specified location and still be placed at that location when the system creates history data.
- Number of days to keep history data: Time period for which the system retains history data.
- Minimum amount of time between updating the user's location (in seconds): Time period the system waits before updating a user's location, regardless of how often the user accesses tasks.

Location tracking

Geolocation adds the Geolocation tracked field to the User form. In the default view of a user record, select the Geolocation tracked check box to enable location tracking for the user.

When a user has geolocation tracking enabled, the system updates the user's geographic coordinates whenever the user opens, or loads, a record from the Task [task] table or from a table that extends Task. After this initial update, the system continues to update the user's geographic coordinates at a recurring interval if the user does not close or reload the record. To edit the length of this interval, navigate to Geolocation Administration Geolocation Properties and change the setting for the property that regulates the update interval for the user's location. The default setting for this property is 300 seconds (5 minutes).

**Note:** The system can update geographic coordinates only for users who have location services enabled in their browsers. Even users who have the Geolocation tracked check box selected may be prompted by their browsers to share or withhold their location.

State flows

State flows enable an administrator to customize transitions from one state to another in tables derived from the Task [task] table and configure the system to perform work during transitions to specific states.

An example of a state transition is when the State field in an incident changes from Active to Awaiting User Info. An administrator might want to trigger an event during this transition or make a specific field mandatory when the incident reaches the end state.

State transitions in the Field Service Management application were reimplemented to use state flows. For information about customizing Field Service Management state flows, see State flow customization.

Installed with state flows

Several types of components are installed with state flows.

Tables installed with state flows

Tables are added with state flows.

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Flow [sf_state_flow]</td>
<td>Contains state flow definitions. This table contains all state flow definitions, including those for work orders and work order tasks.</td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Work Order Flow [sf_work_order]</td>
<td>Contains state flow definitions for work orders. This table is installed when Field Service Management is activated.</td>
</tr>
<tr>
<td>Work Task Flow [sf_work_task]</td>
<td>Contains state flow definitions for work order tasks. This table is installed when Field Service Management is activated.</td>
</tr>
</tbody>
</table>

**Business rules installed with state flows**

Business rules are added with state flows.

<table>
<thead>
<tr>
<th>Business rule</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assert Field Uniqueness in State Flow</td>
<td>State Flow [sf_state_flow]</td>
<td>Ensures that business rules and UI actions are not accidentally copied to new state flows.</td>
</tr>
<tr>
<td>Check Client Script</td>
<td>State Flow [sf_state_flow]</td>
<td>Adds a client script to new records.</td>
</tr>
<tr>
<td>Check Event Rule</td>
<td>State Flow [sf_state_flow]</td>
<td>Adds or deletes event rules, as the event field is updated.</td>
</tr>
<tr>
<td>Check Work Notes Rule</td>
<td>State Flow [sf_state_flow]</td>
<td>Adds or deletes work note rules, as the work notes for a state flow are updated.</td>
</tr>
<tr>
<td>Create Business Rule</td>
<td>State Flow [sf_state_flow]</td>
<td>Automatically creates a business rule when automatic conditions or script are present.</td>
</tr>
<tr>
<td>Create script for Field controls</td>
<td>State Flow [sf_state_flow]</td>
<td>Create scripts for field controls, when they are in use.</td>
</tr>
<tr>
<td>Create UI Action</td>
<td>State Flow [sf_state_flow]</td>
<td>Automatically creates a UI action when manual conditions or script are filled in.</td>
</tr>
<tr>
<td>Delete Related Elements</td>
<td>State Flow [sf_state_flow]</td>
<td>When state flows are deleted, delete all related client scripts, business rules, UI actions and overrides.</td>
</tr>
<tr>
<td>Remove script for Field controls</td>
<td>State Flow [sf_state_flow]</td>
<td>If all field controls are disabled, see if any of the client scripts should be removed.</td>
</tr>
<tr>
<td>State Change</td>
<td>State Flow [sf_state_flow]</td>
<td>Get the correct state choice value when the state is changed.</td>
</tr>
<tr>
<td>Business rule</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------</td>
<td>----------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Update dependent records</td>
<td>State Flow</td>
<td>When a state flow is made active or inactive, ensure the business rule and UI actions are made active or inactive as well.</td>
</tr>
</tbody>
</table>

**Script includes installed with state flows**

Script includes are added with state flows.

**Table 1047: Script includes for state flows**

<table>
<thead>
<tr>
<th>Script include</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>StateFlow</td>
<td>Implements state flows and supports creation of state flow elements, such as business rules, UI actions, dictionary overrides, and client scripts.</td>
</tr>
<tr>
<td>StateFlowAJAX</td>
<td>Allows access to state flow functionality from client scripts.</td>
</tr>
</tbody>
</table>

**Use state flows**

You can create custom state flows for any table that uses states.

Make state transitions occur in any order or skip specific states according to your business practices. State flows can manage the behavior of fields and field visibility on a task form. State flows can also trigger system events that perform work such as sending email notifications.

Administrators can configure state flows to:

- Limit the choice list for the State field to contain only those states that are valid for the flow.
- Define the behavior and visibility of specific fields on a task form when state transitions occur and for certain end states.
- Configure events that are triggered when a task changes states.
- Set up UI actions and business rules to implement certain state transitions, or while the task is in certain states.

The State Flow plugin installs records used by work management to control state transitions for work orders and work order tasks. For detailed information about using work management state flows, see State flow customization.

Creating and customizing state flows requires scripting knowledge. Users with the admin role can create state flow records.

**Dictionary overrides for state flows**

A dictionary override in a state flow defines the starting state for all new records in a specific table.

You set an override in tables that extend a base table only, so that your customizations are applied only to the extended table.

1. In a state flow record, select an Ending state.
   
   This is the override value which becomes the starting state for all new records in the table named.
2. Click Create Default Value.

The system populates the Dictionary override field with a value of state, which is the field in the task table affected by the override. The Dictionary override field is read-only. After the override is created, the system hides the Create Default Value button on all subsequent state flow forms for that table.

**Events triggered on state changes**

You can configure a state flow to trigger a registered system event when a task transitions from a starting state to a specified end state.

For example, you can use events to trigger email notifications and create script actions. When you attach an event to a state flow, the system creates a business rule called State Flow Events for <table name> for the table specified in the state flow. If you specify a start and end state, the business rule executes when the record transitions from the start state to the end state. If the state flow only specifies an end state, the business rule executes whenever that end state is reached. The system creates one business rule for all state flows containing events on a single table. When all events or all state flows on a table are deleted, the system deletes the business rule.

**Field controls**

You can define controls for individual fields that are enforced when a record transitions between states.

Settings in the Field Controls section of the State Flow form enable you to apply field controls when the system detects a specified state transition or when the end state is the current state when the form is opened. The control is applied only to existing fields on the form. State flows cannot add fields to the form.

For example, you might want the Problem field to be visible when an incident moves to the Awaiting Problem state. If the incident state changes to Awaiting User Info, you hide the Problem field and make the Caller field mandatory.

When creating field controls, configure state flow records with an ending state only and to create the correct behavior for every ending state you want to control. This configuration ensures that the field controls are set properly when the user selects a new state, and also when the user returns a record's State field to the original state. Only specify a full state transition, with both a starting and ending state, when you want a particular behavior for that precise state transition.

**Note:** State flows use client scripts to enforce field controls. It is possible that your settings can be changed by existing UI policies, which execute after client scripts.

The system creates the following objects, as needed, to enforce field properties in state flows:

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business rule</td>
<td>State Flow Notes for &lt;table name&gt;</td>
<td>Enforces mandatory fields for the table on which that field behavior is defined.</td>
</tr>
<tr>
<td>Client script (onLoad)</td>
<td>&lt;table name&gt; state flow</td>
<td>Sets possible states and initial mandatory, read-only, and visible properties when a record is loaded.</td>
</tr>
</tbody>
</table>
### Rebuild state flows

You can rebuild state flows when a mismatch between existing and new sys_ids occurs.

When you use an XML file to import a state flow record into an instance, the system attempts to match the incoming states with existing states by comparing sys_ids. Because the sys_ids of items in a choice list can vary between instances, the system can fail to match the states, even though they are otherwise identical.

When matching fails, the start and end states of affected records are left blank or contain numeric values. To repair these records navigate to State Flows Admin Rebuild State Flows. This module runs a script that compares the numerical value of each item in the State field choice list until it finds a match in the imported state flow record.

### State flow cleanup

### Work notes

#### Create a state flow

Creating State Flows.

2. Fill in the fields, as appropriate.

   The system enforces the field controls with the same client script that filters the choice list for the State field.

#### Table 1049: Creating state flows

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Automatically generated record number</td>
</tr>
<tr>
<td>Table</td>
<td>[Required] Table on which the state flow record runs. Only tables that extend the Task [task] table are available in the list.</td>
</tr>
<tr>
<td>Starting state</td>
<td>Name of the state at the beginning of the transition. The selections in this field are filtered by the possible states for the table selected.</td>
</tr>
<tr>
<td>Ending state</td>
<td>Name of the state at the end of the transition. The selections in this field are filtered by the possible states for the table selected.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Client script</td>
<td>Client script to run for this transition. The client script controls the available states you can select by limiting the contents of the State choice list to valid states. This client script also controls specific field behavior configured for state changes in the Field Controls section of the form.</td>
</tr>
<tr>
<td>Event</td>
<td>Name of an existing event to trigger when this transition occurs. See <a href="#">events triggered on state changes</a> for more information.</td>
</tr>
<tr>
<td>Name</td>
<td>Name of this record. Make sure the name is descriptive of the state transition or the processing that the record is performing. This name does not have to be unique.</td>
</tr>
<tr>
<td>Roles</td>
<td>Not used for any processing.</td>
</tr>
<tr>
<td>Active</td>
<td>Enables or disables this state flow record.</td>
</tr>
<tr>
<td>Class</td>
<td>Defines the state flow class for this record. The system selects the appropriate class from these options:</td>
</tr>
<tr>
<td></td>
<td>• State Flow: Records created for state flows in all task-based tables except those in work management.</td>
</tr>
<tr>
<td></td>
<td>• Work Order Flow: Records created for state flows in the Work Order [wm_order] table. This class is available when work management is activated.</td>
</tr>
<tr>
<td></td>
<td>• Work Task Flow: Records created for state flows in the Work Order Task [wm_task] table. This class is available when work management is activated.</td>
</tr>
<tr>
<td>Dictionary override</td>
<td>Sets the starting value for the State field on all new records for the table named in the state flow record. See <a href="#">dictionary overrides</a> for configuration procedures.</td>
</tr>
<tr>
<td>Work notes</td>
<td>Noteworthy comments about this state flow transition. For details about how these notes are used, see <a href="#">Work Notes</a>.</td>
</tr>
<tr>
<td>Comment</td>
<td>Details about the customized record.</td>
</tr>
<tr>
<td>Manual (Runs scripts from a UI action that require the user to click a button or related link.)</td>
<td>Conditions for enabling a UI action that cannot be defined with the condition builder. For example, you can use this string to define UI actions for mobile devices. This condition has an [and] relationship with the condition in the Manual condition field.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Manual condition</td>
<td>Conditions for enabling a UI action that can be defined for fields in the target table. This condition has an [and] relationship with the condition in the Manual condition string field.</td>
</tr>
<tr>
<td>Manual script</td>
<td>Script that defines what the UI action does when the conditions are true. This script runs when the user clicks a button or a related link.</td>
</tr>
<tr>
<td>UI action</td>
<td>[Read Only] Name of the button that the system creates to enable this transition. The system creates the label using the same name as the state flow record that created it.</td>
</tr>
<tr>
<td>Automatic condition string</td>
<td>Conditions for running the business rule that cannot be defined with the condition builder, such as evaluating if the proposed transition is a valid flow. This condition has an [and] relationship with the condition in the Automatic condition field.</td>
</tr>
<tr>
<td>Automatic condition</td>
<td>Conditions for running the business rule that can be defined for fields in the target table. This condition has an [and] relationship with the condition in the Automatic condition string field.</td>
</tr>
<tr>
<td>Automatic script</td>
<td>Script that performs additional work when the condition is true. This script can do tasks such as update the date and time the transition occurred or notify someone using email when a specific state change occurs. Automatic state transitions occur when changes are made to the task record.</td>
</tr>
<tr>
<td>Business rule</td>
<td>Name of the business rule created for this transition. Two conditions must be satisfied before this business rule can run. The task must be on a specific starting state, and the Automatic condition must be true. If both of these conditions are satisfied, the business rule performs the transition requested, using the starting and ending states from the State Flow form.</td>
</tr>
<tr>
<td>Field Controls (Determines field properties when a record transitions between states or reaches a specific end state.)</td>
<td></td>
</tr>
<tr>
<td>Mandatory fields</td>
<td>Makes the selected fields required when this transition occurs, or when the end state is the current state.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Read only fields</td>
<td>Prevents the selected fields from being edited when this transition occurs, or when the end state is the current state.</td>
</tr>
<tr>
<td>Visible fields</td>
<td>Displays the selected fields when this transition occurs, or when the end state is the current state.</td>
</tr>
<tr>
<td>Not mandatory</td>
<td>Makes the selected fields optional when this transition occurs, or when the end state is the current state.</td>
</tr>
<tr>
<td>Not read only</td>
<td>Makes the selected fields editable when this transition occurs, or when the end state is the current state.</td>
</tr>
<tr>
<td>Not visible</td>
<td>Hides the selected fields when this transition occurs, or when the end state is the current state.</td>
</tr>
</tbody>
</table>

3. Determine if you want the state transition method to be manual or automatic and open the appropriate section on the form.
   - Manual: Click Create UI Action to create a button on the task form that enables users to execute the transition manually. The system uses the value in the Name field as the label for the UI action. The UI action executes the script in the Manual Script field when the conditions are true. For example, a manual transition can create an Activate button when an incident is in the New state that enables a user to mark the incident as active.
   - Automatic: Click Create Business Rule to create the business rule. The business rule executes the script in the Automatic Script field when the conditions are true. For example, a business rule created by the system can set an incident state to Assigned when the Assigned to field is populated. Business rules are automatically deleted when the state flow record is deleted. For more information, see Business Rules.

4. Click Create Client Script to create the script that limits the values offered in a task record's State field to valid states for that transition.

5. Configure the fields in the Field Controls section to control how specific fields display when a task record changes states.

State flow cleanup

The business rules, client scripts, and UI actions that the system creates automatically to perform custom transitions exist only while the state flow records that use them are present.

When all the state flows on a table are deleted, the system attempts to delete any unnecessary programming elements that were created on that table, using these criteria:

<table>
<thead>
<tr>
<th>Element</th>
<th>Deleted When</th>
</tr>
</thead>
<tbody>
<tr>
<td>UI action</td>
<td>The state flow that created it is deleted.</td>
</tr>
<tr>
<td>Business rule</td>
<td></td>
</tr>
<tr>
<td>Dictionary override</td>
<td></td>
</tr>
<tr>
<td>Element</td>
<td>Deleted When</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Business rule that processes events triggered by a state flow</td>
<td>All state flows for the table specified that have events configured are deleted.</td>
</tr>
<tr>
<td>Client script (onLoad)</td>
<td>All state flows for the table are deleted.</td>
</tr>
<tr>
<td>Client script (onChange)</td>
<td>All state flows with field controls are deleted.</td>
</tr>
<tr>
<td>Work notes business rule</td>
<td>All state flows with field controls or work notes are deleted</td>
</tr>
</tbody>
</table>

Work notes

Work notes are an important part of the state flow process and are used to communicate information about state transitions.

The state flow adds these work notes to the Work notes field of any task making this transition.

These rules apply to state flow work notes:

• For a state flow with no Starting state, the work note is added every time the task transitions to the Ending state.
• For a state flow with a Starting state and an Ending state, the work note is added only when the task transitions from that starting state to that ending state.
• If two state flows with work notes have the same Ending state, but only one has a Starting state, the system adds the work notes from the state flow with the starting state. This better matches the state flow work note to the more important transition between specific starting and ending states.

Domain separation and State Flows

This is an overview of domain separation and State Flows. Domain separation is not supported in this application. For more information, see Application support for domain separation.

Overview

Support: Data only

Domain separation is supported in this application. Not all ServiceNow applications support domain separation; some include limitations on the data and administrative settings that can be domain separated. To learn more, see Application support for domain separation.

Survey Management

With the ServiceNow® Survey Management application you can create, send, and collect responses for basic surveys. If installed, you can also use the Survey widget to set up a survey within Service Portal.

Explore

- Assessments and Surveys release notes
- Upgrade to London
- Get started with Survey Management on page 2439

Set up

- Survey Management roles on page 2441

Administer

- Survey designer on page 2467
- Survey users and groups on page 2490
- Customize the appearance of a survey on page 2493
Get started with Survey Management

Two versions of the application are supported, Survey Management, which is the latest version, and Legacy Surveys. Survey Management improves the user interface and extends the capabilities of the Legacy Surveys application.

Note: Survey Management does not support domain separation.

Configuring surveys

There are many options for advanced configuration in Survey Management:

• Create a survey, add questions, and choose recipients, all in one interface.
• Create conditional questions, which appear only when users answer other questions a certain way.
• Restrict a survey so only specific survey users can take it, and send invitations to those users simultaneously. Alternatively, make the survey a public survey so that any user can take the survey, even users who have not logged in to the ServiceNow system.
• Set a schedule to automatically assign a survey to users and to limit how often the same user can take a survey.
• Customize the look and feel of survey questionnaires.
• Save anonymous survey responses.
• Convert survey responses to numerical scores and view them on scorecards.
• Deactivate a survey for maintenance or to retire it without deleting it.
**Note:** Because surveys use the same tables and other back-end components as assessments, you may see assessment elements such as table and field names in certain places throughout the survey feature.

---

**Legacy Surveys**

Survey administrators can continue to use legacy survey functionality and data, however, it is recommended that you migrate legacy surveys to the Survey Management application. Concurrent use of both survey applications can cause confusion and redundancy.

Survey wizards are not impacted and cannot be migrated.

**Note:** The Legacy Surveys application is not described in the documentation that you are viewing. It is documented on the ServiceNow wiki.

---

### Table 1051: Version comparison

<table>
<thead>
<tr>
<th>Capability</th>
<th>Surveys</th>
<th>Legacy Surveys</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surveys in Service Portal.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Save new survey responses each time a user takes the same survey.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Create question templates to reuse sets of answer options.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Categorize survey questions and report on category results.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deactivate a survey without deleting it.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Create conditional questions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Send surveys automatically based on a schedule.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customize survey questionnaire color scheme.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Save anonymous survey responses for logged-in users.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>View survey responses on graphical scorecards.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Save surveys in a draft state until they are ready to publish.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capability</td>
<td>Surveys</td>
<td>Legacy Surveys</td>
</tr>
<tr>
<td>------------</td>
<td>---------</td>
<td>----------------</td>
</tr>
<tr>
<td>Create and send surveys from one page.</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Allow only specific users to access a survey.</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Send surveys based on conditions.</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Send survey email notifications.</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Limit how often a user can take the same survey.</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Add introduction and end note text.</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Create survey modules.</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Public survey: Allow persons to take a survey without logging in.</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Use update sets to track changes.</td>
<td>✔️</td>
<td>✔️</td>
</tr>
</tbody>
</table>

**Survey Management roles**

The Survey Management application uses the following roles.

No role is required to take assigned survey questionnaires.

<table>
<thead>
<tr>
<th>Table 1052: Survey Management roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Role</td>
</tr>
<tr>
<td>Survey administrator [survey_admin]</td>
</tr>
<tr>
<td>Survey reader survey_reader</td>
</tr>
</tbody>
</table>
Key survey terms

These survey terms are used throughout the documentation to describe survey management functions and capabilities.

Table 1053: Key survey terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey definition</td>
<td>Root record on which a survey is built. A survey definition contains information such as the survey name, state, and distribution schedule. Each survey definition has its own categories and questions. Survey definitions are comparable to legacy survey masters.</td>
</tr>
<tr>
<td>Public survey</td>
<td>Any user can take a public survey, even users who have not logged in to the ServiceNow system. For a completed survey, the Assigned to field value is Guest.</td>
</tr>
<tr>
<td>Survey category</td>
<td>Represents a theme for survey questions. Categories contain one or more questions. The system creates one category per survey by default. Additional categories are optional.</td>
</tr>
<tr>
<td>Survey question</td>
<td>A question that appears on a survey questionnaire for the associated survey definition. Survey questions are comparable to legacy survey questions.</td>
</tr>
<tr>
<td>Survey user</td>
<td>User who is authorized to receive invitations for a restricted survey.</td>
</tr>
<tr>
<td>Survey instance</td>
<td>Represents one survey questionnaire assigned to one user. Survey instances are comparable to legacy survey instances.</td>
</tr>
<tr>
<td>Trigger condition</td>
<td>Defines a rule that enables the system to send a survey when an action occurs on a table, such as when an incident closes. Trigger conditions are comparable to legacy survey conditions.</td>
</tr>
<tr>
<td>Scorecard</td>
<td>Visual representation of survey responses. Scorecards display a variety of data summaries for one survey definition.</td>
</tr>
</tbody>
</table>

Survey questionnaires

All surveys that are assigned to you appear in your personal assessment and survey queue.
No special role is required to complete a survey but you must be logged in and the survey must be assigned to you. When you submit a survey, the system stores your responses.

**Survey notification**

If the system is configured to send email, it sends you a notification when a survey is assigned to you. The message contains a link to the survey and instructions for viewing the assessment and survey queue.

*Take a survey*

Surveys that are assigned to you, and that are not complete, appear in your assessment and survey queue.

Role required: none

Each assessment or survey appears as a card in the queue. The card contains helpful information, including the survey name, state, and due date, and a button to launch the questionnaire. Overdue surveys are clearly marked with a red icon and red due date. You must answer every mandatory question, indicated by a red asterisk, before you can submit the survey. If you start to take a survey but cannot complete it, save your responses and return to it later. When you have answered all the questions and are satisfied with the responses, submit the survey.

1. Navigate to **Self-Service My Assessments & Surveys**.

   Users with the assessment_admin role, including survey administrators, can display other users’ assessments and surveys in addition to their own. Use the Show all and Show assigned to me related links at the bottom of the queue to show and hide assessments and surveys. Click a card assigned to another user to open the associated metric type or survey definition.

2. Click **Take Survey** on a survey card to open the questionnaire.

   If there is more than one survey category, you can click the collapse or expand icon to hide or show the questions in the category.

3. Answer each question to the best of your ability.

   If you are unsure of how to respond to a question or if a question does not apply to a particular record, select Not Applicable, if available.

4. Complete one of the following steps.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Save your responses without submitting them</td>
<td>Click Save. You can close the questionnaire and access it later from your queue.</td>
</tr>
<tr>
<td><strong>Note:</strong> The system does not save the survey if there are invalid responses, such as a letter in a date field. You must enter valid responses or remove invalid responses before you can save the survey.</td>
<td></td>
</tr>
<tr>
<td>Submit the survey after answering all questions</td>
<td>Click Submit. You cannot return to the questionnaire after submitting.</td>
</tr>
<tr>
<td><strong>Note:</strong> If there is an unanswered mandatory question or an invalid response, an error message appears and the problematic questions are temporarily highlighted.</td>
<td></td>
</tr>
</tbody>
</table>
Domain separation for Survey Management

This is an overview of domain separation as it pertains to Survey Management. Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.

Overview

Support: Data only

Domain separation is supported in this application. Not all ServiceNow applications support domain separation; some include limitations on the data and administrative settings that can be domain separated. To learn more, see Application support for domain separation.

As a survey creator, survey_admin can create surveys in the assigned domain. A Global domain survey_admin can create or edit surveys in any domain.

As a survey taker, a user can access the survey record and take the survey based on the domain of the survey record and user. Global domain users can take a survey in any domain.

How domain separation works in Survey Management

There are several main areas to consider in how domain separation works in Survey Management.

Survey Management in domain-separated instances

The following domains are available by default after activating the Domain Support-Domain Extensions Installer [com.glide.domain.msp_extensions.installer] plugin. Only ServiceNow employees can activate this plugin.

- Global
- Acme
- Cisco

Access to surveys in domain-separated instances

Based on the domain of the survey record and users, users can access the survey record and take the survey.

Global domain users can access survey records in any domain. Users in any other domain can access records in their domain and Global domain. For example, users in the Acme domain can access records in the Acme domain and the Global domain.

Global domain users can take a survey in any domain. Users in any other domain can take surveys in their domain as well as the Global domain. For example, users in Acme domain can take surveys in the Acme domain and the Global domain.

<table>
<thead>
<tr>
<th>Location of the survey record</th>
<th>Users who can access and take the survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>Global</td>
</tr>
<tr>
<td>Global</td>
<td>Yes</td>
</tr>
<tr>
<td>Acme</td>
<td>Yes</td>
</tr>
<tr>
<td>Cisco</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Any domain user can assign a survey in that domain to the same domain user or a Global domain user. For example, an Acme domain user can assign a survey to a Global domain user or an Acme domain user. Users from other domains are not visible to the Acme domain user.

Although the Global domain user can view a survey from other domains, this user cannot assign the survey of one domain to a user from a different domain. For example, a Global domain user can assign a survey from the Acme domain to another Global domain user or an Acme domain user, but not to a Cisco domain user.

**Note:** When a task is closed in a child domain and the assigned survey is either in the child domain or the global domain, the user from the child domain can then take the survey.

**Trigger conditions in domain-separated instances**

A Global domain user can create a triggered condition for a survey from any domain. The Global domain user can create an incident and trigger the survey by selecting a user from the other domain in the User field under Caller. However, the Global user cannot assign the survey to the user of different domain.

A user can assign a trigger condition to a survey if the user belongs to the Global domain or the Survey domain.

If there is no domain path for a trigger condition, users from any domain can view the trigger condition. For example, in the asmt_condition table that has no column for the domain path, users from the Acme domain can view the trigger condition created by the Cisco domain users.

**Survey responses and results**

There is a metric result record for each user response to each question on every survey instance. Survey results for each question and category are calculated automatically based on the metric result records.

If you use survey result calculations for results and scorecards, ensure that the positive indicator field for the question is set appropriately, based on the answer options. To have any results, a category must contain scored questions.

**Survey responses**

Survey responses are stored in the Metric Result [asmt_metric_result] table and display the recipients' answers to each question in a category. To view general results, navigate to Survey Survey Responses. To view results for a particular criterion, use a filter on the Metric Result [asmt_metric_result] table. For example, to view results based on the assignment group, apply a filter condition for assignment group.
Category results

Category results are stored in the Assessment Category Result [asmt_category_result] table and display the overall ratings for each category based on the weighted value for each scored question. To
view these results, navigate to Assessments Results Category results and filter the results using the [Type.Evaluation method] [is] [Survey] condition.

Figure 463: Assessment category results

Survey scorecards

A scorecard provides a visual breakdown of survey responses, based on the way questions were answered, by category. To access a scorecard, see View a survey scorecard on page 2451.

View results for all surveys

You can view the survey responses that are stored on the Metric Result [asmt_metric_result] table.

Role required: survey_admin or survey_reader

1. Navigate to Survey Survey Responses.
   
   Do not confuse this module with Survey Legacy Surveys Survey Responses, which displays legacy survey responses.
The Type column displays the survey definition each response is associated with.
2. Select a response to view its details.

View the results for a survey

You can view the responses for one survey definition. Survey results are stored on the Metric Result [asmt_metric_result] table.

Role required: survey_admin or survey_reader

1. Navigate to SurveyView Surveys
2. Open a survey definition.
3. Under Related Links, click View Responses, which is available only if there are results.
   The results are grouped by metric, which is what questions are called in assessments.
4. Open a metric result to view more detail.
   The metric result contains the user's response and calculated values of interest to advanced survey administrators. Because the Metric Result table is also used by the assessment feature, many field names are not clear in the context of surveys.

Metric result fields

List of field descriptions for the Metric Result form.
### Table 1054: Metric Result form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assessment group</strong></td>
<td>Assessment group to which the metric result belongs. An assessment group is a container for survey instances and results generated in a single occurrence. The system generates an assessment group every time at least one survey instance is created. If multiple survey instances are created at once, such as when a survey administrator sends invitations to a list of survey users, they are all stored in the same assessment group.</td>
</tr>
<tr>
<td><strong>Metric</strong></td>
<td>Question that the user answered.</td>
</tr>
<tr>
<td><strong>Data type</strong></td>
<td>Data type of the question the user answered.</td>
</tr>
<tr>
<td><strong>Method</strong></td>
<td>Assessment method. Always Assessment for surveys.</td>
</tr>
<tr>
<td><strong>Updated</strong></td>
<td>Date and time the metric result was last updated.</td>
</tr>
<tr>
<td><strong>Source</strong></td>
<td>Survey definition from which the associated survey instance was generated.</td>
</tr>
<tr>
<td><strong>Assigned to</strong></td>
<td>User who completed the survey questionnaire.</td>
</tr>
<tr>
<td><strong>Instance</strong></td>
<td>Survey instance completed by the Assigned to user.</td>
</tr>
<tr>
<td><strong>Actual value</strong></td>
<td>Value obtained from the user response to the question. The actual value is determined by the question data type:</td>
</tr>
<tr>
<td></td>
<td>• Checkbox: The actual value is 0 if the check box is cleared and 1 if it is selected.</td>
</tr>
<tr>
<td></td>
<td>• Choice or Likert Scale: The actual value is equal to the Value of the metric definition associated with the chosen answer option.</td>
</tr>
<tr>
<td></td>
<td>• Date, Date/Time, or String: The actual value is -1 to indicate that these data types do not contribute to category result calculations.</td>
</tr>
<tr>
<td></td>
<td>• Template: The actual value is equal to the Value of the template definition associated with the chosen answer option.</td>
</tr>
<tr>
<td></td>
<td>• Yes/No: The actual value is 0 if the response is No and 1 if it is Yes.</td>
</tr>
<tr>
<td><strong>Normalized value</strong></td>
<td>Adjusted value that accounts for the Scale definition setting, minimum and maximum values, and other factors. The equation that generates the value and an example calculation appear in <em>Example: calculate the normalized value for a survey metric</em> on page 2450.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>String value</td>
<td>Value that displays the response as it appears on a questionnaire. In some cases this is the same as the Actual value, such as when the question data type is Percentage. The string value is N/A for unanswered questions of certain data types.</td>
</tr>
</tbody>
</table>

**Example: calculate the normalized value for a survey metric**

The normalized value is calculated based on a linear equation and the scale definition of the metric.

**Equation used to calculate the normalized value**

\[
\text{Normalized value} = \frac{(\text{Input Value} - \text{Min value defined in metric})}{(\text{Max value defined in metric} - \text{Min value defined in metric})} \times \frac{\text{current metric weight}}{(\text{sum of valid metric weight})} \times \text{scale\_factor}
\]

**Note:** The normalized values are directly proportional to the scale definition of the metric. If the scale definition is low, that is, the lower scale values are better, then \(\text{Normalized value} = 1.0 - \text{Normalized value}\).

**Example**

Calculate the normalized value for the Please rate the competency of the technician metric. The metric has the following values:

**Table 1055: Values of the metric**

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input value</td>
<td>3</td>
</tr>
<tr>
<td>Minimum value</td>
<td>1</td>
</tr>
<tr>
<td>Maximum value</td>
<td>6</td>
</tr>
<tr>
<td>Current metric weight</td>
<td>10</td>
</tr>
<tr>
<td>Number of responses</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>• 4 of type=number</td>
</tr>
<tr>
<td></td>
<td>• 1 of type=yes/no</td>
</tr>
<tr>
<td></td>
<td>• 1 of type=string (invalid data type; value cannot be calculated)</td>
</tr>
<tr>
<td>Valid metric weight of each response</td>
<td>10</td>
</tr>
<tr>
<td>Scale factor</td>
<td>10</td>
</tr>
</tbody>
</table>

\[
\text{Normalized value} = \frac{(3 - 1)}{(6 - 1)} \times \frac{10}{(10 + 10 + 10 + 10 + 10)} \times 10 = 0.8
\]

Several data types are ignored because the values cannot be calculated. These invalid data types include string, date, and datetime.

For reporting purposes, use the Metric Result [asmt_metric_result] table.
View a survey scorecard

A survey scorecard provides a visual breakdown of survey responses by category, based on the way questions were answered.

Role required: survey_admin or survey_reader

A scorecard displays charts for survey results, in which category and question responses are analyzed and current ratings are compared with previous ratings. Users can examine ratings over time, compare question ratings, or compare the ratings of all categories. All ratings are averages for the time range selected. The system dynamically updates a scorecard each time you view it, so the ratings reflect recently completed surveys.

1. Navigate to Survey View Surveys.
2. Open a survey definition.
3. Under Related Links, click View Scorecard. The interactive scorecard displays the following filters:
   - Question Results: Displays the result of all questions or an individual question.
   - Category Results: Displays the results of all questions associated with an individual category or all categories.
   - Average Ratings: Displays the result of weighted average rating for each survey question in an individual category or all categories.
   - History: Displays the result of all questions in comparison with their history (by calendar year or quarters).
   - Sentiment Analysis Results: Displays the results of sentiment analysis for the survey.

**Note:** The scorecard link is hidden if there are no survey results to report.

*Survey scorecard category results*
The Category Results view is a stacked bar chart showing survey results for all questions in an individual category or all categories by respondent count.

Select a category from the list to display the questions from that category in the chart.

This view displays responses that use the following data types:

- Checkbox
- Choice
- Likert Scale
- Number
- Template
- Yes/No
- Multiple selection
- Image Scale
- Numeric Scale

**Note:** The Checkbox and Yes/No data types are combined into the Boolean data type in the Survey Designer
Figure 464: Survey category results

To view details about a specific response, point to the colored bar to display the response, the number of responses, and the percentage it represents of all the responses to that question.

Figure 465: Survey scorecard category results detail
Survey scorecard question results
The Question Results filter displays the result of all questions or an individual question using charts or lists. For the String, Attachment, Date, Date/time, Reference, and Ranking data types, the results are displayed in the list view. The results of all other data types are displayed in the pie chart view.

Pie chart
The pie chart shows question results for all data types other than those that are displayed in the list view. See Survey question data types on page 2480.

- Checkbox.
- Boolean.
- Choice.
- Likert Scale.
- Number.
- Percentage.
- Yes/No.
- Image Scale.
- Multiple Selection.
- Template. The question result shows the aggregated net promoter score (NPS) with promoters, detractors, and passives.

<table>
<thead>
<tr>
<th>Question score</th>
<th>NPS category</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 or 10</td>
<td>Promoter</td>
</tr>
<tr>
<td>7 or 8</td>
<td>Passive or Neutral</td>
</tr>
<tr>
<td>0 to 6</td>
<td>Detractor</td>
</tr>
</tbody>
</table>

The result is calculated as:

- \( \% \text{Promoters} = \frac{\text{Number of promoters}}{\text{Sample size}} \)
- \( \% \text{Detractors} = \frac{\text{Number of detractors}}{\text{Sample size}} \)
- \( \% \text{Passives} = \frac{\text{Number of passives}}{\text{Sample size}} \)
- \( \text{NPS} = \% \text{Promoters} - \% \text{Detractors} \)

Note: The Checkbox and Yes/No data types are combined into the Boolean data type in the survey designer.
Service Desk Satisfaction Survey

Survey Scorecard

How courteous and respectful was the technician who responded? (1=poor, 6=excellent)

- 2 = 2 (14.29%)
- 3 = 2 (14.29%)
- 4 = 9 (54.29%)
- 5 = 1 (7.14%)

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Survey scorecard average ratings
The Average Ratings view displays the weighted average rating for each survey question in an individual category or all categories.

Use this view to learn how individual questions affect the overall rating for the category. Select a survey category from the choice list to display the chart for that category.
Service Desk Satisfaction Survey

Survey Scorecard

Average question rating in category: Service Desk Satisfaction Survey

- How courteous and...
- How satisfied are...
- How satisfied were...
- Please rate the t...
- Was technician ab...

Average Normalized value
To view the effect of each question's ratings on the entire category's ratings, point to the colored bar. The pop-up box shows the percentage of the total ratings represented by each individual question's weighted average.

![Graph showing Compare Plans and Benefit Satisfaction](image)

**Figure 468: Average ratings detail**

*Survey scorecard history*

The History view compares the current ratings for the categories and their questions with ratings from the previous three years or four quarters.

Ratings that have declined are highlighted in red and display negative numbers. Ratings that have improved are highlighted in green with positive numbers. Arrow icons beside the values in the Diff column indicate the trend of the current survey against the previous survey.

Point to a category to display a line chart that shows the rating trend for that category. Click a category to view the Survey Category form containing the survey questions.
3 years

To calculate the current ratings, the system averages the ratings from the trailing twelve month (TTM) period. The Diff column shows the discrepancy between the current ratings and the previous calendar year's ratings.
### Service Desk Satisfaction Survey

#### Survey Scorecard

<table>
<thead>
<tr>
<th></th>
<th>Current</th>
<th>Diff</th>
<th>2013</th>
<th>2012</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Rating</td>
<td>5.40</td>
<td>0.00</td>
<td>5.40</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Service Desk Satisfaction Survey</td>
<td>5.40</td>
<td>0.00</td>
<td>5.40</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>How satisfied were you with the response time to your incident? (1=not at all, 6=completely)</td>
<td>0.00</td>
<td>-1.02</td>
<td>1.02</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>How courteous and respectful was the technician who responded? (1=poor, 6=excellent)</td>
<td>0.00</td>
<td>-1.21</td>
<td>1.21</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Please rate the technical competency of the technician serving you (1=poor, 6=excellent)</td>
<td>0.00</td>
<td>-1.02</td>
<td>1.02</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Was technician able to resolve your issue during the first call?</td>
<td>0.00</td>
<td>-1.00</td>
<td>1.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>How satisfied are you with your overall service experience? (1=not at all, 6=completely)</td>
<td>0.00</td>
<td>-1.14</td>
<td>1.14</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Figure 470: Survey scorecard history - 3 years
4 quarters

Quarterly surveys compare the average rating for each question and category in the current quarter against the average ratings from the previous four quarters. The Diff column shows the discrepancy between the current ratings and the previous quarter's ratings. The column labels count backward, by quarter from the current quarter. For example, if the current quarter is the 3rd quarter of 2015, then the previous quarters appear as 2nd [2015], 1st [2015], 4th [2014], and 3rd [2014]. All four of the previous quarters appear, whether or not there was any data for those quarters.
Figure 471: Survey scorecard history - 4 quarters
Export a survey scorecard as an image
You can export a scorecard as an image to use in presentations or other documents.

Role required: admin or survey_admin

1. Click the menu icon ( ) and select Save as PNG or Save as JPEG and wait for the export to complete.

2. Click Download and save the scorecard image to a storage location.
Survey administration

Survey administrators—users with the survey_admin role—create and maintain surveys and configure how they are distributed and published. Surveys on Service Portal are also supported.

Survey administration includes the following procedures.

- Create, customize, and publish surveys.
- Write and maintain survey questions.
- Define trigger conditions for when surveys are sent to users, such as when an incident closes.
- Maintain surveys and survey questions as the organization’s needs change.

To set up surveys in Service Portal, you must first install Service Portal and then configure the Survey widget on the page. The base system includes the Survey widget.

Surveys in Service Portal

If Service Portal is installed, you can use the Survey widget to set up surveys, quizzes, assessments, risk assessments, and attestations in Service Portal. Surveys for users on mobile devices are fully supported in Service Portal.

To create an intuitive interface for your users, you can set up surveys in Service Portal on page 2610. You must first install Service Portal and then configure the survey widget on the page. To learn more about configuring a widget, see configure widget instances.
To configure a Survey widget on a page, CTRL + right-click the widget heading and select Instance Options.

### Table 1057: Service Portal: Instance options (properties) for the Survey widget

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max records</td>
<td>Number of surveys to list on the Service Portal homepage. The user can click the View all link to view all items. Default: 5</td>
</tr>
<tr>
<td>Title of the widget</td>
<td>Text that appears in the title bar of the surveys widget. Default: My Surveys</td>
</tr>
</tbody>
</table>
Each survey on the My Surveys page contains a progress bar and a description. The color in the progress bar increases as a survey is completed. In the case of a triggered record, the table title is used for the survey description.

For mobile users, the *Pagination setting for Service Portal view* survey designer property is set to one question per page by default.
One Click survey

A One Click survey has no introduction page in Service Portal. This survey does not have the Submit and Cancel buttons in the desktop and iPad view.

**Note:**
- The One Click Survey field should be selected in the survey definition.
- If the public access is enabled for a One Click survey, a user can submit the survey without having to log in.

A kiosk survey is a One Click survey with only one question of any of the following types:
- Image Scale
- Choice
- Likert Scale
- Numeric Scale
- Yes/No

When you click the answer of the kiosk survey question in Service Portal, the survey is submitted and the end note is displayed on the same page as that of the survey questions.

**Note:**
- A kiosk survey does not have any Submit or Cancel buttons.
- A kiosk survey cannot have a signature, dependent questions, or additional information.

URI parameters for One Click survey

Pass these URI parameters through the createAssessment() API to store their values in the asmt_assessment_instance table for both platform view and Service Portal view.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sysparm_refresh_interval</td>
<td>Refresh time (in seconds) after the survey submission to create another instance. For example, sysparm_refresh_interval=5.</td>
</tr>
<tr>
<td>sysparm_trigger_table</td>
<td>Location that is stored as the Trigger Table field in the asmt_assessment_instance table. For example, sysparm_trigger_table=incident.</td>
</tr>
<tr>
<td>sysparm_trigger_id</td>
<td>Location sysId that is stored as the Trigger ID field in the asmt_assessment_instance table. For example, sysparm_trigger_id=1c741bd70b2322007518478d83673af3.</td>
</tr>
<tr>
<td>Parameter</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>sysparm_kiosk</td>
<td>When set to true, both sysparm_trigger_table and sysparm_trigger_id parameters should be specified. This is a mandatory parameter for kiosk requests. For example, sysparm_kiosk=true.</td>
</tr>
</tbody>
</table>

### View the overview of all surveys

Use this homepage to view various survey reports such as results by metric type and state. You can refresh, add, delete, and rearrange widgets. All reports on the Survey Overview page have demo data.

Role required: admin or survey_admin

1. Navigate to Survey Overview.
   The following reports are available:

   **Table 1059:**

<table>
<thead>
<tr>
<th>Report</th>
<th>Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surveys by Metric Type and State</td>
<td>Assessment Instance [asmt_assessment_instance]</td>
</tr>
<tr>
<td>Assignment group Customer Satisfaction 90 day average</td>
<td>Metric Result [asmt_metric_result]</td>
</tr>
<tr>
<td>Service Desk Survey 'Overall Experience' 60 Days</td>
<td>Metric Result [asmt_metric_result]</td>
</tr>
<tr>
<td>Service Desk Survey 'Timely Response' 90 Days</td>
<td>Metric Result [asmt_metric_result]</td>
</tr>
<tr>
<td>Service Desk Survey 'First Call Resolve' 60 Days</td>
<td>Metric Result [asmt_metric_result]</td>
</tr>
<tr>
<td>Service Desk Survey 'Tech Courteous' 90 Days</td>
<td>Metric Result [asmt_metric_result]</td>
</tr>
<tr>
<td>Service Desk Survey 'Tech Competence' 60 Days</td>
<td>Metric Result [asmt_metric_result]</td>
</tr>
</tbody>
</table>

2. Click elements within the reports to view the required information.
3. To refresh, edit, or close a widget, point to the widget and select the required option.

### Survey designer

Users with the survey_admin role can use the survey designer. The survey designer lets you create survey categories and questions, configure the details, and publish the survey to specific users or groups.

You can assign a survey to individual users or groups who receive all the questions from all the categories. You can also customize each question and make it dependent on the response to another question. The following describes the procedures you follow to create and publish a survey.

- Create survey categories.
- Create questions within each category.
- Configure survey details, such as introductory and closing remarks and time limit.
- Select recipients for the survey.
- Publish the survey to the selected users or groups.

**Note:** The survey designer replaces the survey creator in the Legacy Surveys application. If you are using Internet Explorer version 8 or earlier, the system redirects you to the survey creator.

Survey designer elements
The survey designer is accessible from Survey Survey Designer.

The survey designer contains controls, a header bar, and the design canvas.

**Controls**

To create a question, drag the appropriate data type control from the Controls palette and drop it onto the designer canvas.
Figure 472: Controls
The assessment engine provides a built-in result calculation feature that converts responses to scored question data types to a score from 0 through 10.

<table>
<thead>
<tr>
<th>Data type</th>
<th>Scored</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attachment</td>
<td>No</td>
<td>Question with a Manage Attachments icon that allows users to attach one or more files.</td>
</tr>
<tr>
<td>Boolean</td>
<td>Yes</td>
<td>Question with a check box or Yes and No choices for user responses.</td>
</tr>
<tr>
<td>Choice</td>
<td>Yes</td>
<td>List of predefined options. For more information, see the definition of the Choices field in Create a question in the survey designer on page 2475.</td>
</tr>
<tr>
<td>Date</td>
<td>No</td>
<td>Date field.</td>
</tr>
<tr>
<td>Date/Time</td>
<td>No</td>
<td>Date and time field.</td>
</tr>
<tr>
<td>Number</td>
<td>No</td>
<td>Number field with predefined minimum and maximum values. The default is 1-10.</td>
</tr>
<tr>
<td>Percentage</td>
<td>No</td>
<td>Percentage field with a prescribed range.</td>
</tr>
<tr>
<td>Scale</td>
<td>Yes</td>
<td>Predefined Likert scale. Answer options appear as radio buttons.</td>
</tr>
<tr>
<td>Numeric Scale</td>
<td>Yes</td>
<td>Selectable number scale. The default is 1-5. Answer options appear as radio buttons.</td>
</tr>
<tr>
<td>String</td>
<td>No</td>
<td>Single or multi-line text field.</td>
</tr>
<tr>
<td>Template</td>
<td>Yes</td>
<td>Choice list of templates that provide a predefined scale of options. For details, see Quiz scorecards on page 2378.</td>
</tr>
<tr>
<td>Reference</td>
<td>No</td>
<td>Choice list of fields from a specified reference table. This data type does not support reference qualifiers. For example, a user could select a user name if you specify sys_user as the reference table.</td>
</tr>
<tr>
<td>Data type</td>
<td>Scored</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Image Scale</td>
<td>Yes</td>
<td>Question with a choice of images that can be selected. A template can be used to apply the same images to multiple questions.</td>
</tr>
<tr>
<td>Multiple Selection</td>
<td>Yes</td>
<td>Question with multiple check boxes that can be selected.</td>
</tr>
<tr>
<td>Ranking</td>
<td></td>
<td>Question with an order number to be selected for each option. One order number cannot be selected twice. This question can be mandatory and it can also be dependent on a parent question, but not vice versa.</td>
</tr>
</tbody>
</table>

**Header bar**

The tabs on the header bar display views and a menu of functions. Click a tab to change the view on the canvas:
- **Design**: Add and configure the properties of categories and questions. This is the default view.
- **Configuration**: Create introductions and end notes for surveys and select a signature.
- **Availability**: Select the recipients for each category in the survey.

Point to the menu icon (≡) to select an option. The list of options depends on the currently open survey.
- **Save**: Save the current survey without changing its state.
- **Preview**: Display a preview of the survey as it appears to recipients.
- **Publish**: Distribute the survey to the selected recipients.
- **Save and Publish**: Save the survey to the Draft state and distribute the survey in one step.
- **New Survey**: Open a fresh canvas for a new survey.
- **Load Survey**: View the list of existing surveys.
- **Copy Survey**: Copy the current survey.

**Design canvas**

New surveys open in the canvas of the Design view. The survey Name field appears above first category in the canvas. A blank question field appears in the category container.
Configure a survey in the survey designer
Configuration settings apply to the entire survey.
Role required: admin or survey_admin

Select Configuration in the survey designer and complete the Survey Designer Configuration form:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>Select the check box to enable the distribution of this survey to recipients.</td>
</tr>
<tr>
<td>Anonymize responses</td>
<td>Select the check box to collect survey responses anonymously. Recipients are not listed with survey results. When a user submits a survey, the system clears the Assigned to field for the associated survey instance. Also, survey responses for anonymous surveys do not contain Assigned to values.</td>
</tr>
<tr>
<td>Description</td>
<td>Description of this configuration or the survey to which it is attached.</td>
</tr>
<tr>
<td>Introduction</td>
<td>Introductory content to display on surveys. You can add a welcome message or background information about the survey.</td>
</tr>
<tr>
<td>Signature</td>
<td>Acknowledgement by a survey recipient of requirements, admonitions, or expectations related to a survey.</td>
</tr>
</tbody>
</table>

**Note:** The Assigned to field is cleared. However, each response record includes the Created By and Updated By fields that are accessible to users with the survey_admin role.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return URL</td>
<td>Destination address of a web page that is presented to users after they submit a completed survey. When a return URL is configured, the End note content does not appear.</td>
</tr>
<tr>
<td>End note</td>
<td>Content that is displayed to recipients after they submit a completed survey. You can add a thank you message, follow-up instructions, or other applicable information. End notes are not displayed if a Return URL is specified.</td>
</tr>
<tr>
<td>Public Survey</td>
<td>Enables public access to the survey. No login is required to take a public survey and users or non-users can respond anonymously. For completed public surveys, the Assigned to field value is Guest.</td>
</tr>
<tr>
<td>Note:</td>
<td>This check box is available only after you save the survey.</td>
</tr>
<tr>
<td>Survey Publish URL</td>
<td>Specifies a URL of the survey that can be shared with users.</td>
</tr>
<tr>
<td>Note:</td>
<td>This field is available only after you publish the survey.</td>
</tr>
</tbody>
</table>
| Pagination setting for Service Portal view | Specify how the user will see pages on the desktop or tablet view in Service Portal.  
  • Category: Display each category on a separate page.  
  • Question: Display each question on a separate page. This happens for mobile regardless of this setting.  
  • None: All items on a single page—no pagination  
  Default: Category  
  Note: This field appears only when Service Portal is installed.                                                                                          |
| One Click Survey            | Enables a One Click survey in Service Portal.                                                                                                                                                              |
| Note:                       | This option can be selected if the Pagination setting for Service Portal view is set to None.                                                                                                             |
### Source Table
Table whose field is used as a dynamic value for a question in a triggered survey.

**Note:** When you select a source table, ensure that its relevant field is selected as Source Field value of a metric.

### Allow Sentiment Analysis
Enables sentiment analysis for this survey.

### Duration
Amount of time that recipients are given to complete this survey, starting from the time that the survey is generated. The default duration is 14 days.

**Note:** By default, the system runs the Cancel Expired Assessments script every 30 days to cancel expired survey, assessment, and quiz instances that are in the Work in progress or Ready to take states.

---

**Survey categories**
Survey categories provide a way to group questions of a similar theme for a given survey.

There must be at least one survey category per survey definition and every survey question must be associated with a category. When you create a survey, the system generates one category, which all the questions belong to.

For simple surveys, one category is usually enough. Consider creating additional categories if you want to accomplish any of the following tasks.

- Separate groups of questions into collapsible sections by category on the survey questionnaire.
- Report on category scores, which are calculated based on responses for all questions within each category.

**Create a category in the survey designer**
A category represents a theme for evaluating a specific element of the survey topic and contains questions pertaining to that theme.

**Role required:** admin or survey_admin

When you create a survey, the system creates a default category, using the name of the survey. You can use this category, modify it, and create additional categories as needed. To have any results, a category must contain scored questions.

1. Navigate to Survey Survey Designer.
2. Enter the name of the survey in the Name field. The system uses this name as the name of the survey and of the first category.
3. To configure the category, click the gear icon in its title bar and complete the following steps in the Properties dialog box.
   a) Enter a new name and a description for the category.
   b) Enter text in the Details field that introduces or explains the category to recipients.
c) Click the X icon to close the Properties dialog box and save your settings.

4. To add a new category, click the + icon in the title bar of an existing category. The new category appears below the category that you selected to create it. You can click the X icon in a category header to delete a category that you added in error.

Create a survey category in a survey
You can modify an existing survey to add one or more survey categories.

Role required: admin or survey_admin

Only one category is required for each survey, but you can add additional categories as needed.

1. Navigate to Survey View Surveys.
2. Open a survey definition.
3. In the Metric Categories related list, open a category or click New.
   Each survey category is stored as a record on the Metric Category [asmt_metric_category] table with a modified view for survey use.
4. Enter the survey category name and description.
   The category name appears on questionnaires when either of the following is true.
   • There is more than one category for the survey.
   • There is only one category and its name is different from the survey definition name. If you create a survey using the survey creator, the category name is the same as the survey definition name.
5. Right-click the form header and click Save.
   The Assessment Metrics and Users related lists appear.
6. Click Update.

Create a question in the survey designer
You can create multiple questions for each category in the survey designer, but each question can only be associated with one category.

Role required: admin or survey_admin

The data type that you select for each question determines how it can be answered by survey recipients.

1. In the Design view, drag a data type icon from the Controls palette and drop it into a category container.
2. To configure the question, click the gear icon in its title bar.
   The Properties dialog box opens.
3. Complete the form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Concise name of the question. The system uses this value to identify the question in Assessment Metric lists and in scorecard charts.</td>
</tr>
<tr>
<td>Question</td>
<td>Text to display as the question on surveys. Enter a clear, straightforward question that is easy to understand.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Type</td>
<td>Data type selected for this question. See the table in <em>Controls</em> for the available data types.</td>
</tr>
<tr>
<td>Active</td>
<td>Check box that determines whether this question is available on a survey. A question does not appear on surveys that are generated after the question becomes inactive.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Check box to require users to answer the question. Mandatory questions are denoted by a red field status indicator and must be answered before the survey can be submitted.</td>
</tr>
<tr>
<td></td>
<td>This field is available when the question does not have a dependency and the question type is not Boolean with a check box option.</td>
</tr>
<tr>
<td>Allow Additional Information</td>
<td>If selected, the Additional Information Label field is enabled. The Additional Information Label field value is displayed as a field on the survey response page to provide additional information for a question.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This is not applicable for the String and Template data types.</td>
</tr>
<tr>
<td>Boolean option</td>
<td>Whether a check box or a Yes/No list appears as the option for a Boolean question.</td>
</tr>
<tr>
<td>String option</td>
<td>Setting for the appearance of a string field in a question. This field is available when the question type is String. The string options include the following.</td>
</tr>
<tr>
<td></td>
<td>• Single line: Single-line text field 40 characters in length that allows strings of any length.</td>
</tr>
<tr>
<td></td>
<td>• String line wide: Full page width text field that allows a single-line entry of any length.</td>
</tr>
<tr>
<td></td>
<td>• Multiline: Full page width multiline text field that allows word wrap and returns</td>
</tr>
<tr>
<td>Min</td>
<td>Lowest positive whole number that users can enter or select to answer the question. This field is available when the question type is Number, Percentage, or Numeric Scale.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Max</td>
<td>Highest positive whole number that users can enter or select to answer the question. This field is available when the question type is Number, Percentage, or Numeric Scale.</td>
</tr>
<tr>
<td>Allow not applicable</td>
<td>Check box for including Not Applicable as an option for this question. Users can select Not Applicable if they do not have sufficient information to respond to a question. User responses of Not Applicable are excluded from results calculations. This field is available when the question does not have a dependency and the question type is not Boolean with a check box option.</td>
</tr>
<tr>
<td>Randomize answers</td>
<td>Check box for displaying answer options in a random order. Answer preference is sometimes influenced by the order in which options appear, which can result in biased results. Randomizing options can help prevent this bias. <strong>Note:</strong> Randomizing options for certain questions may make those questions confusing for users. In general, only randomize options that do not follow a logical order.</td>
</tr>
<tr>
<td>Positive indicator</td>
<td>Setting that determines whether smaller or larger numerical values equate to a good score in result calculations. Select Low values if smaller numerical values are better, such as for a question that measures the number of incidents for a vendor. Select High values if larger numerical values are better, such as for a question that measures user satisfaction on a scale of one to five.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| **Source Field**              | Source table field that appears as a dynamic value for the question in a triggered survey. When this field value is selected, a ${param} placeholder is added at the end of the question label.  
  
  **Note:** You can move this placeholder anywhere in the question label.  
  
  When a user takes the survey, the question with dynamic value is included in the survey instance and ${param} placeholder is replaced with the source field value.  
  
  If the record table specified in the trigger condition does not match the source table specified for the survey, or if the system fails to get the dynamic value from the source record, the ${param} placeholder is not replaced by any value and is displayed as is in the question.  
  
  For example, if the survey is triggered from a PRB record and the survey question is configured with a dynamic value from Incident, the ${param} placeholder in the survey question label is not replaced by any dynamic value and is displayed as is.  
  
  **Note:** When survey questions are translated to other languages by a survey admin, the ${param} placeholder should not be translated. |
| Allow Sentiment Analysis      | Includes this question for the sentiment analysis of a survey.  
  
  **Note:** This field is available only for String type questions. |
| Details                       | Information about the question that is displayed on the survey. Include details that help users understand how to answer the question. |
### Choices

Options for a question with a data type of Choice or Scale. The system automatically adds text and values that you can edit for each option. You must have at least two options, and each option must have a unique value.

Click the + icon to add an option, or click the X icon to delete an option. By default, the system arranges options in the order established by their values. To change the order, drag and drop the options.

**Note:** Value numbers also contribute to the calculations of survey response scores, which can be used by advanced survey administrators.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choices</td>
<td>Options for a question with a data type of Choice or Scale. The system automatically adds text and values that you can edit for each option. You must have at least two options, and each option must have a unique value. Click the + icon to add an option, or click the X icon to delete an option. By default, the system arranges options in the order established by their values. To change the order, drag and drop the options. <strong>Note:</strong> Value numbers also contribute to the calculations of survey response scores, which can be used by advanced survey administrators.</td>
</tr>
</tbody>
</table>

4. To create any special conditions that must be met before the question appears on the survey, click the Dependency tab.
   The question must have a data type of Boolean, Choice, Scale, or Template.

5. Select a question in the Displayed when field.
   The system selects the appropriate operator and displays the possible answers for the selected question.

6. Select the answer that satisfies the condition.
   You can select more than one answer. Selected answers are indicated by a check mark.
   The system prevents recursive dependencies between questions. For example, if Question A depends on Question B, Question B cannot depend on Question A.

7. Click the X icon to close the question properties dialog box and save your settings.

8. To add a question with the same data type as an existing question in the category, click the + icon in the title bar of the existing question.

9. Drag and drop questions to change their order within a category or move them between categories.

10. To delete a question, click the X icon in its title bar.
Survey question data types
You must choose a data type for each survey question. The data type determines the format of the question and the kind of data that is collected on survey questionnaires.

The following data types are available for surveys:

Attachment data type

On questionnaires, users can attach one or more files to a question.

Users click the Manage Attachments icon and select one or more files in the Attachments pop-up window to attach to the question. From this window, users can:

• View a list of the attached files.
• View an attached file in a separate window.
• Rename an attached file.
• Add or delete files

Once a survey has been submitted, attachments cannot be updated or deleted.

Any type of file supported by the platform can be attached to a question. One or more files can be attached a question while taking a survey or completing an assessment.

The assessment administrator can see the attachments associated with an individual question as well as those associated with the survey.

See Administering Attachments for more information.

Boolean data type

On questionnaires, users select a check box beside a statement or leave it cleared.

If you select Boolean, you must fill in the Scale definition field. Select High if it is best when users select the check box.

Choice data type

On questionnaires, users select a value from a list of choices.
If you select Choice, you must fill in the Scale definition field and create answer options. Select High for the scale definition if the answer option with the largest metric definition Value is best.

**Note:** The system sets the Min and Max fields automatically based on the Value settings for the associated metric definitions.

**Date and Date/Time data types**

The Date and Date/Time data types are similar.

- **Date:** On questionnaires, users select a date.

- **Date/Time:** On questionnaires, users select a date and time.
Likert Scale data type

On questionnaires, users select a multiple choice value from a custom Likert scale. Each answer option is represented by a radio button on the scale. A Likert scale question that evaluates an application's ease of use might have the answer options Easy, Average, and Difficult.

If you select Likert Scale, you must fill in the Scale definition field and create answer options. Select High for the scale definition if the answer option with the largest metric definition Value is best.

Note: The system sets the Min and Max fields automatically based on the Value settings for the associated metric definitions.

Number data type

On questionnaires, users enter a number.
If you select Number, you must fill in these additional fields:

- Scale definition: Select High if a larger number is better, such as for a question that measures the number of sales made in a quarter.
- Min and Max: Enter the smallest and largest numbers users can enter. State the range of acceptable answers in the question text.

**Percentage data type**

On questionnaires, users enter a number.

If you select Percentage, you must fill in these additional fields:

- Scale definition: Select High if a larger percentage is better, such as for a question that measures the percentage of work an agent has completed.
- Min and Max: Enter the smallest and largest numbers users can enter. Generally 0 and 100 are appropriate minimum and maximum values. If you choose values other than 0 and 100, it is usually best to state the range of acceptable answers in the question text.

**Reference data type**

On questionnaires, users select a value from a list that is generated from a specified reference table. The response field supports auto-completion.

**Note:** Reference qualifiers are not supported.

For example, a user could select a user name in response to a question if you specify User [sys_user] as the reference table.
String data type

On questionnaires, users enter text. When you select String, the String option field appears. Select one of the following options to determine how the string field appears on questionnaires:

- Figure 474: Single line
Figure 475: Single line wide

Figure 476: Multiline

**Template data type**

On questionnaires, users select a value from a predefined series of answer options. To use this data type, a question template must be defined.

If you select Template, you must fill in these additional fields:

- **Template**: Select a template.
- **Scale definition**: Select High if the answer option with the largest template definition Value is best.

**Yes/No data type**

On questionnaires, users select Yes or No from a list.

If you select Yes/No, you must fill in the Scale definition field. Select High if Yes is the best answer.
Image Scale data type

On questionnaires, users select an image from a predefined set of images as their response. Image scale questions can also be used in a template for better performance with surveys that have the same type of answer options.

Five emojis, similar to the Likert scale (very dissatisfied to very satisfied) are provided. However, you can upload additional images in JPG, PNG, or GIF format. Two images can be uploaded, one for selected case and another for unselected case. Larger size images are reduced to 64 x 64 pixels.

The result behavior depends on the presence of uploaded images. If no selected image is uploaded, then the question shows up blank.

<table>
<thead>
<tr>
<th>Selected image</th>
<th>Unselected image</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Unselected image loads. Clicking on the image changes it to the selected image.</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
<td>Selected image loads with 50% opacity. Clicking on the image changes the opacity to 100%.</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>A blank placeholder box is displayed.</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>A blank placeholder box is displayed.</td>
</tr>
</tbody>
</table>

Note: N/A option is not supported for image scale type question.

Multiple selection data type

On questionnaires, users can select multiple check boxes indicating all answers that apply. For instance, a user can be instructed to “Select all that apply” in a multiple selection question.
Ranking data type

On questionnaires, users can select a different order number for each option to rank them. Drag-and-drop functionality is also supported, which allows a user to either fill in the number, or simply drag an option.

1. Please rate following device in order of importance.

One order number cannot be selected twice. This question can be mandatory and it can also be dependent on a parent question, but not vice versa.

Edit a survey in the survey designer
You can modify surveys using the survey designer.

Role required: admin or survey_admin
You can edit a survey even after it has been distributed, with the following results.

- Added questions are available only on surveys that are distributed after this change.
- Changes to existing questions are immediately available to users before the survey is submitted or during the retake period. This includes changes to the answers, such as additional choices or changes to the data type.
- Deleted questions are also deleted from the distributed surveys in user queues.

**Note:** You can only edit a survey that has the same application scope as that of your current session.

1. Navigate to Survey Survey Designer.
2. Point to the menu icon in the survey header bar, and select Load Survey.
3. Select a survey from the list and modify it as needed.

**Configure category weights for a survey**

You can assign a weight to each category in a survey. The system calculates results from the weight that you configure.

Configure the Survey Category form to display the Weight field.

Role required: admin or survey_admin

Weights are set to a value of 10 by default but can be changed.

1. Navigate to Survey View Surveys and select a survey from the list.
2. In the Survey Definition form, select a category from the Metric Categories related list.
3. Edit the default weight value.
4. Click Update.

**View a survey instance**

A survey instance represents one questionnaire assigned to one user. You view an instance to verify that survey instances were created, to check the state of a survey instance, or to reassign a survey instance.

Role required: admin or survey_admin

1. Navigate to Survey Survey Instances. The following sub-modules are available based on the state of the instances:
   - Ready to take: Displays survey instances that are ready to be taken by the user. By default, these instances are sorted in ascending order by the Number field.
   - In progress: Displays survey instances that are in progress. By default, these instances are sorted in ascending order by the Number field.
   - Completed: Displays survey instances that are complete. By default, these instances are sorted in descending order by the Taken on field.
   - Cancelled: Displays survey instances that are cancelled. By default, these instances are sorted in ascending order by the Number field.
   - All: Displays survey instances in all states. By default, these instances are sorted in ascending order by the Number field.

2. Open a survey instance from the required sub-module. By default, the following fields are displayed in the Survey Instance form for all sub-modules other than Completed.

**Note:**

- When you open an instance in the Completed sub-module, you are redirected to the User's Response page.
• Each survey instance is stored as a record on the Assessment Instance [asmt_assessment_instance] table with a modified view for survey use.

Table 1062: Survey Instance form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Automatically generated record number.</td>
</tr>
<tr>
<td>Metric type</td>
<td>Survey definition this survey instance was created from. Survey definitions are stored on the Assessment Instance table, and the field label on that table is Metric type.</td>
</tr>
<tr>
<td>Due date</td>
<td>Date by which the survey instance should be completed. The system populates the due date based on the Assessment duration of the associated survey definition, which is set to 14 days by default. The survey due date is not enforced in the base system. If you want to enforce the due date, consider using a workflow or other mechanism to send survey recipients reminders when a survey is overdue. Note: By default, the system runs the Cancel Expired Assessments script every 30 days to cancel expired survey, assessment, and quiz instances that are in the Work in progress or Ready to take states.</td>
</tr>
<tr>
<td>State</td>
<td>State of the survey instance.</td>
</tr>
<tr>
<td>Assigned to</td>
<td>User this survey instance is assigned to. This field becomes read-only when the state is In progress, Complete, or Canceled.</td>
</tr>
<tr>
<td>Domain</td>
<td>Domain associated with the instance.</td>
</tr>
<tr>
<td>Expiration date</td>
<td>Date on which the assigned user can receive a new instance of the same survey definition. The system automatically populates the expiration date based on the Schedule period of the associated survey definition.</td>
</tr>
<tr>
<td>Related Link</td>
<td></td>
</tr>
<tr>
<td>View User's Response</td>
<td>Shows a read-only version of the survey responses completed by the user.</td>
</tr>
</tbody>
</table>
### Field

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sends the survey instances for sentiment analysis.</td>
</tr>
</tbody>
</table>

**Note:** This link is available only if any sentiment analysis result is not available for this instance under Survey Question Sentiment Results.

### Related List

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>All instance question records, which store user response values for each question on the survey questionnaire. The following columns are relevant to surveys:</td>
</tr>
<tr>
<td>Category: Displays the survey categories the questions belong to.</td>
</tr>
<tr>
<td>Metric: Displays the survey questions.</td>
</tr>
</tbody>
</table>

---

### Survey users and groups

Survey users and survey user groups help survey administrators control who can take a survey.

Survey administrators can restrict a survey so that only specified users can access it unless a survey administrator manually assigns the survey to a different user. Survey user groups provide a way to quickly designate multiple survey users.

### Administering survey users

The list of survey users for a survey is visible on the Survey Definition and Survey Category forms. You can add or remove users from the list of survey users at any point. Note that designating a survey user does not automatically generate a survey instance for that user unless both of the following conditions are true:

- The survey definition Schedule period is set to Daily, Weekly, Monthly, or Yearly. In this case the system assigns a new survey instance to each survey user at the beginning of each schedule period.
- The user has no instances of the survey that are incomplete or that have not yet reached their expiration date.

You can designate survey users from the Survey Designer, the Survey Definition form, or the Survey Category form.

**Note:** If there are trigger conditions for a survey, do not create survey users. Instead, use the Trigger Conditions form to assign users.

### Create a survey user group

Survey user groups are groups that have the Type field set to survey and that display only the information most relevant to surveys. You can assign survey groups or any user group to surveys.

Role required: admin, user_admin, or survey_admin
Though it is possible to designate members of any group as survey users, one reason to create a survey group is to view it conveniently in the survey User Groups module.

1. Navigate to Survey Administration User Groups.
2. Click New.
3. Complete the Group form.
4. Right-click the form header and click Save. The Group Members and Groups related lists appear.
5. To add group members, complete the following steps.
   a) In the Group Members related list, click Edit.
   b) Select users from the list on the left and add them to the Group Members List on the right.
   c) Click Save.

Select recipients for a survey in the Survey Designer
You can assign survey users while designing or modifying the survey.
Role required: admin or survey_admin
1. In the Survey Designer, click the Availability tab.
2. Under Accessible by:, select the Specific users option, then select users.
3. If desired, select the Survey groups only check box, then select survey user groups or other groups.
4. Click Save.

Designate a survey user
You can designate one survey user at a time from the Survey Definition form.
Role required: admin or survey_admin
1. Navigate to Survey View Surveys.
2. Open a survey definition.
   There must be at least one category.
3. In the Survey Users related list, click New.
4. Select a User.
5. Click Submit.
   The Survey Definition form reopens.
6. To remove survey users, in the Survey Users related list, select the check box beside the user, and then select Delete from the action list below the list.

Designate or remove multiple survey users at one time
Use the Survey Category form to designate or remove multiple survey users at a time.
Role required: admin or survey_admin
1. Open a survey definition.
2. In the Metric Categories related list, open a category.
   You can choose any category. The system applies survey user changes to all the survey's categories automatically.
3. In the Users related list, click Edit.
4. Use the slushbucket to add or remove survey users.
5. Click Save to return to the survey category.
   The changes are also reflected in the Survey Users related list on the survey definition.
Allow recipients to retake a survey
You can configure a survey to allow recipients to resubmit their answers as many times as they like, up to the survey's due date.

Configure the Survey Definition form to display the Allow retake field. For more information, see Configuring the form layout.

Role required: admin or survey_admin

Results are not calculated for the survey until the configured duration has elapsed. The card in the user's queue remains visible until the due date of the survey, and a button is displayed to allow retakes.

1. Navigate to Surveys View Surveys.
2. Select a survey from the list.
3. Select the Allow retake check box.
4. Click Update.

Copy a survey

Create a copy of a survey with at least one category. All associated questions (type), configurations, categories, metrics, domain separation rules, and role-based categories are copied. Assigned users, category users, instances, and trigger conditions are not copied.

Role required: survey_admin or admin

1. Navigate to Survey View Surveys.
2. Open a survey definition.
3. Perform any of the following steps:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>From Platform</td>
<td>In the title bar, click Copy.</td>
</tr>
<tr>
<td>From Platform</td>
<td>In the title bar, select Copy from the context menu.</td>
</tr>
</tbody>
</table>
| From survey designer | 1. In the title bar, click Survey Designer.  
                            2. In the Survey Designer title bar, point to the menu icon ( ) on the header bar and click Copy Survey |

Publish a survey

You must publish a survey to enable people to receive and complete survey instances.

Role required: admin or survey_admin

The State field on the Survey Definition form indicates whether the survey is in the Draft or Published state.

**Note:** You cannot return a survey to the Draft state after it has been published. You do have the option to deactivate a survey by clearing the Active check box.

1. Navigate to SurveyView Surveys and select a survey to publish.
2. Click Publish.
When you publish a survey, the system generates survey instances for any associated survey users. You can assign the survey to other users manually.

**Publish a survey in the Survey Designer**
You must save changes to a survey before you can publish it to the specified recipients or groups.

Role required: admin or survey_admin

1. In the Survey Designer, point to the menu and select Load Survey.
2. Select a survey to publish.
3. To preview the survey as a user, point to the menu icon and click Preview.
4. When you are satisfied with the survey, click either Save and Publish or Publish to distribute it.

   When you publish a survey, the system sends email notifications to the recipients and to their managers. The system displays a link to the survey on a card in each recipient's My Assessments & Surveys portal.

**Customize the appearance of a survey**
Assessment and survey administrators can set properties to customize the color of various elements on the questionnaires.

Role required: admin or survey_admin

---

**Note:**

- For color properties, enter either an HTML color name or hexadecimal (hex) value. For hex values, the # character is required. Values are not case-sensitive.
- For example, all of the following formats are valid: LightGray, lightgray, #D3D3D3. A preview of the color appears next to the field.

---

Note that the customizations you make apply to all assessments and surveys.

1. Navigate to either of the following modules.
   - Assessments Admin Assessment Properties
   - Survey Administration Properties

2. On the properties page, edit the properties as needed.

Refer to the screenshot below to see what parts of assessment questionnaires are controlled by the properties.
3. Click Save.
   You may need to clear the browser’s cache to see updates.

Assessment and survey properties
You can configure a variety of properties to customize the appearance of assessment and survey questionnaires, require authentication for user signatures, open surveys in the service portal view from emails, and limit the number of items shown in a decision matrix field filter.

Table 1063: Assessment and survey properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Label</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sn_portal_surveys.sp_survey.email_redirection</td>
<td>Allow survey link from email to open in service portal view (applies only for surveys)</td>
<td>When Yes is selected, a survey accessed from a link in an email opens in the Service Portal.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> This property applies only to surveys.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: No</td>
</tr>
<tr>
<td>com.snc.assessment.signature_authentication</td>
<td>Require authentication for user signature.</td>
<td>When Yes is selected, this property requires credentials for a full name signature.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: Yes</td>
</tr>
<tr>
<td>css.assessment.question.header.background.color</td>
<td>Assessment question header background color</td>
<td>Sets the background color of question headers on assessment and survey questionnaires.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: #767676</td>
</tr>
</tbody>
</table>
**Survey definitions**

A survey definition is the root record upon which a survey is built.

The survey designer generates a survey definition automatically when you save or publish the survey. Survey administrators may want to modify the survey definition to configure additional options for the survey, or to publish the survey when it is ready for distribution.

Survey administrators and survey readers can also send survey invitations directly to users from the survey definition.

*Modify a survey definition*

You can configure additional options for a survey definition.

**Role required:** admin or survey_admin

1. Navigate to Survey View Surveys.
   
   Each survey definition is stored as a record on the Assessment Metric Type [asmt_metric_type] table with a modified view for survey use.

2. Open a survey definition. The Response Trend chart with the weekly trend of the survey instance count, and the Survey Summary chart with the overall summary response based on instance states are displayed.

3. Modify the fields on the Survey Definition form, as appropriate.

**Note:** You can only edit a survey that has the same application scope as that of your current session.

---

**Table 1064: Survey Definition form**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the survey, which appears on the questionnaire.</td>
</tr>
<tr>
<td>Description</td>
<td>Helpful information about the survey.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Active</td>
<td>Check box to activate the survey definition. When the Active check box is cleared, new survey instances cannot be generated and users cannot complete existing survey instances. Use the Active check box to deactivate or activate a published survey.</td>
</tr>
<tr>
<td>Anonymize responses</td>
<td>Check box to ensure that all responses for this survey are stored without the submitting user names. When a user submits a survey, the system clears the Assigned to field for the associated survey instance. Also, survey responses for anonymous surveys do not contain Assigned to values.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> The Assigned to field is cleared. However, each response record includes the Created By and Updated By fields that are accessible to users with the survey_admin role.</td>
</tr>
<tr>
<td>Send notifications</td>
<td>Check box to send a notification that the survey has been taken.</td>
</tr>
<tr>
<td>State</td>
<td>Status of the survey: Draft or Published.</td>
</tr>
<tr>
<td>Allow retake</td>
<td>Check box that allows users to modify their answers to a completed survey. Users can resubmit a survey as many times as they want until the due date. After that date, the system removes the survey from the user's My Assessments &amp; Surveys page.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Scheduled job         | Scheduled job the system creates for this survey definition when the schedule period is a repeating interval. The system sets the scheduled job to run according to the selected schedule period. If you change the schedule period and save the survey definition:  
  • The system deletes the old scheduled job.  
If you selected a recurring schedule period:  
  • A new scheduled job is created.  
For example, if you change the schedule period from Daily to Weekly and save the record:  
  • The system deletes the daily scheduled job.  
  • Creates a weekly one set to run a week from the current date.  
This field is visible to administrators only if the schedule period is Daily, Weekly, Monthly, or Yearly.                                                                                                                                                                                                                                               |
<p>| Assessment duration   | The length of time to complete assigned survey instances, starting from the time the survey instance is generated. The assessment duration sets the Due date for each survey instance. The default duration is 14 days. Configure the form to see this field.                                                                                                                                                                                                                                               |
| Note                  | By default, the system runs the Cancel Expired Assessments script every 30 days to cancel expired survey, assessment, and quiz instances that are in the Work in progress or Ready to take states.                                                                                                                                                                                                                                                             |
| Send notifications    | Select the check box to send notifications for the survey when it is published. Configure the form to see the field.                                                                                                                                                                                                                                                                                                                                                                             |
| Other Options         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sample Metric</strong></td>
<td>A metric of the current survey that you can include as an image in the email or invitation sent to a survey user. When the survey user clicks the image in the email or while previewing the HTML body, the entire survey is available to be taken.</td>
</tr>
<tr>
<td><strong>Signature</strong></td>
<td>Acknowledgement by a survey recipient of requirements, admonitions, or policies related to the survey. The signature may require the recipient to select a check box or to type a full signature to verify having read these assertions. You can display assertions without requiring a signature. Select an existing signature from the list or click New to create a new one. The signature form contains these fields:</td>
</tr>
<tr>
<td></td>
<td>• Name: Descriptive name for this signature.</td>
</tr>
<tr>
<td></td>
<td>• Signature type: Type of signature required. The selections are Check box, Full name, or Assertion only. If Assertion only is selected, no signature is required to submit the survey.</td>
</tr>
<tr>
<td></td>
<td>• Assertion: Text you want to display to recipients.</td>
</tr>
<tr>
<td></td>
<td>By default, a property called Require authentication for user signature (com.snc.assessment.signature_authentication) requires users to authenticate when providing a full name signature.</td>
</tr>
<tr>
<td><strong>Schedule period</strong></td>
<td>Option that determines how often a user can take the same survey and whether the system generates survey instances on a schedule.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> If you use a trigger condition for a survey, ensure the schedule period is set to No Limit. Trigger conditions use a different method to regulate how often users can receive survey instances.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Pagination setting for Service Portal view</td>
<td>The setting on which the pagination is based for desktop or tablet view in Service Portal.</td>
</tr>
<tr>
<td>• Category: default</td>
<td></td>
</tr>
<tr>
<td>• Question: 1 question per page</td>
<td></td>
</tr>
<tr>
<td>(automatic for mobile)</td>
<td></td>
</tr>
<tr>
<td>• None: no pagination</td>
<td></td>
</tr>
<tr>
<td>Note: This field is displayed only when Service Portal is installed.</td>
<td></td>
</tr>
<tr>
<td>One Click Survey</td>
<td>Enables a One Click survey in Service Portal.</td>
</tr>
<tr>
<td>Note: This option can be selected if the Pagination setting for Service Portal view is set to None.</td>
<td></td>
</tr>
<tr>
<td>Source Table</td>
<td>Table whose field is used as a dynamic value for a question in a triggered survey.</td>
</tr>
<tr>
<td>Note: When you select a source table, ensure that its relevant field is selected as Source Field value of a metric.</td>
<td></td>
</tr>
<tr>
<td>Allow Sentiment Analysis</td>
<td>Enables sentiment analysis for this survey.</td>
</tr>
<tr>
<td>Introduction &amp; End Notes</td>
<td></td>
</tr>
<tr>
<td>Introduction</td>
<td>Introductory content to display on survey questionnaires. Consider adding a company logo, a welcome message, background information about the survey, or instructions.</td>
</tr>
<tr>
<td>End note</td>
<td>End note that appears when someone submits a survey questionnaire. Consider adding a thank you message, follow-up instructions, or other applicable information.</td>
</tr>
<tr>
<td>Related Links</td>
<td></td>
</tr>
<tr>
<td>Enable Public Access</td>
<td>Link that enables/disables the survey as a public survey. No login is required to take a public survey (including a survey with a trigger condition) and users or non-users can respond anonymously. For completed public surveys, the Assigned to field value is Guest.</td>
</tr>
<tr>
<td>Remove Public Access</td>
<td></td>
</tr>
<tr>
<td>Note: You can use the View Survey URL related link to share the URL with users.</td>
<td></td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>View Responses</td>
<td>Link that opens the list of responses for this survey. This related link is available only if there are results for the survey.</td>
</tr>
<tr>
<td>View Scorecard</td>
<td>Link that opens the scorecard for this survey. This related link is available only if there are results for the survey.</td>
</tr>
<tr>
<td>View Survey URL</td>
<td>Link that opens a dialog box that displays a URL for this survey. The URL is useful for sharing a public survey. This related link is available only if the Active check box is selected. The URL does not work until the survey definition is published.</td>
</tr>
<tr>
<td>Show Benchmarks</td>
<td>Opens the Benchmarks Dashboard that provides visibility into your key performance indicators (KPIs) and trends.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong></td>
</tr>
<tr>
<td></td>
<td>• This related link is available only for survey_admin, assessment_admin and survey_reader with bm_viewer role.</td>
</tr>
<tr>
<td></td>
<td>• You must opt in to Benchmarks to view the dashboard. See Enable Benchmarks</td>
</tr>
<tr>
<td></td>
<td>• This is applicable only for a published survey.</td>
</tr>
<tr>
<td>Create Improvement Initiative</td>
<td>Opens the Improvement Initiative window to create an improvement initiative record that helps in improving the performance of the survey.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong></td>
</tr>
<tr>
<td></td>
<td>• This related link is available only for the survey_admin and assessment_admin role. A survey_reader can only view the created improvement initiative records.</td>
</tr>
<tr>
<td></td>
<td>• You should activate the Continual Improvement Management plugin (com.sn_cim).</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Retry Sentiment Analysis</td>
<td>Checks all survey instances of this survey that do not have sentiment analysis data and sends them for analysis.</td>
</tr>
</tbody>
</table>

**Related Lists**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trigger Condition</td>
<td>Displays all trigger conditions associated with the survey.</td>
</tr>
<tr>
<td>Survey Responses</td>
<td>Displays all responses associated with the survey.</td>
</tr>
<tr>
<td>Metric Categories</td>
<td>All survey categories for this survey.</td>
</tr>
<tr>
<td>Survey Users</td>
<td>All survey users who are authorized to take this survey. If no users are listed, any user can take this survey.</td>
</tr>
<tr>
<td>Assessment Instances</td>
<td>All survey instances for this survey. Configure the form to add this related list to see it.</td>
</tr>
</tbody>
</table>

**Note:** If you add a related list to the form, use list control to omit the New button. The system generates survey instances to produce functional surveys.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improvement Initiatives</td>
<td>Displays improvement initiatives associated with the survey.</td>
</tr>
</tbody>
</table>

**Note:** This related list is available only when there is at least one improvement initiative record.

4. Save the record.

**Schedule periods**

The available schedule periods are Only Once, No Limit, Daily, Weekly, Monthly, and Yearly.

The default schedule period is No Limit. When you set the schedule period to anything except Only Once or No Limit, the system creates a corresponding scheduled job. The scheduled job performs the following actions.

- Ensures that a user can take one survey instance of the same survey per schedule period.
- Generates a new survey instance for each survey user at the beginning of the new schedule period, as long as the survey user does not have an incomplete instance of that survey. A survey instance is incomplete if the state is not Complete.

For example, if you set the schedule period to Monthly and someone attempts to send survey invitations twice in the same day, the system generates survey instances for the survey users the first time only. At the beginning of the next schedule period, the system generates another survey instance for each survey user who completed the previous one.

Schedule periods are enforced by the Expiration date field on the survey instance. As long as the survey instance expiration date has not passed, the assigned user cannot receive a new survey instance.
When the system generates a survey instance and the schedule period is anything except No Limit, the Expiration date field is automatically set to the appropriate date. For example, if the schedule period is Weekly, the expiration date is a week after the survey instance is generated.

If you change the schedule period, the scheduled job updates automatically to the correct schedule. However, users who have survey instances for the survey cannot receive new survey instances until their existing survey instances expire, regardless of the new schedule period.

Consider the following example: Sal Pindell receives a survey instance when the schedule period is Weekly. The next day, a survey administrator changes the schedule period to No Limit. Sal cannot receive another survey instance until one of the following actions occurs.

- Seven days pass from the time Sal's survey instance was generated.
- A survey administrator deletes Sal's survey instance.

After one of these actions occurs, Sal can receive a new survey instance anytime, as long as he has no incomplete instances of the survey.

**Note:** If you use a trigger condition for a survey, ensure the schedule period is set to No Limit. Trigger conditions use a different method to regulate how often users can receive survey instances.

---

**Create a survey designer template question**

You can create a question that uses choice lists from a template.

**Role required:** admin or survey_admin

1. Navigate to Survey Survey Designer and load a survey or create a new survey.
2. Drag the Template data type icon into a category container.
3. Click the gear icon in the question title bar to open the template properties dialog box.
4. Select a predefined scale from the list.
Question entry fields appear for that template.

5. Enter one or more questions that are appropriate for the template.
6. Click the arrow to the right of a question to configure its properties. You must provide a name for each question.
7. Click the back arrow to return to the template properties dialog box.
8. Configure the properties for the remaining questions.
9. Click the X icon to close the template properties dialog box and save your settings.

Survey questions

Survey questions appear on survey questionnaires for the associated survey definition.

The survey creator generates questions and answer options automatically. However, it provides only the basic configuration options for questions, such as the question text and the data type. You may want to create additional questions or set advanced configuration options for the questions, including making a question appear conditionally or making a question mandatory. You can also use question templates to define reusable sets of answer options.

Survey questions are available from Survey Questions. The list displays information about each question, including the associated survey definition listed in the Type column, and the data type. Survey administrators can modify these questions.

Create or modify survey questions
You can create and administer survey questions.
Role required: admin or survey_admin

Changes to a survey, such as the addition of questions or the modification of question templates, do not apply immediately to the existing survey instances. However, the changes apply immediately to any new survey instances that are created after the changes are saved.

1. Navigate to Survey View Surveys.
2. Open a survey definition.
3. In the Metric Categories related list, open a category.
4. In the Assessment Metrics related list, open an existing question or click New.
   Each survey question is stored as a record on the Assessment Metric [asmt_metric] table with a modified view for survey use.
5. Complete the Survey Question form.
   The fields that appear depend on the selected Data type.

Table 1065: Survey Question form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the question. When you create a survey, the question name is the same as the text in the Question field.</td>
</tr>
<tr>
<td>Question</td>
<td>Text to use for the question, which appears on survey questionnaires.</td>
</tr>
<tr>
<td>Data type</td>
<td>Data type of the question. The fields for the response depend on the data type.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> If another question depends on this question, you cannot change the data type.</td>
</tr>
<tr>
<td>Template</td>
<td>Question template to use for the answer options.</td>
</tr>
<tr>
<td></td>
<td>This field is visible and required only if the data type is Template.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> If another question depends on this question, you cannot change the template.</td>
</tr>
<tr>
<td>Scale definition</td>
<td>Setting that determines whether smaller or larger numerical values equate to a good score in result calculations. Select Low if smaller numerical values are better, such as for a question that measures the number of incidents for a vendor. Select High if larger numerical values are better, such as for a question that measures user satisfaction on a scale of one to five.</td>
</tr>
<tr>
<td></td>
<td>This field is visible and required only when certain data types are selected.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Randomize answers</td>
<td>Check box that determines whether to present the answer options for this question in a random order each time a user opens the survey. Answer preference is sometimes influenced by the order in which answer options appear, which can result in biased results. Randomize answer options to help prevent this bias.</td>
</tr>
<tr>
<td></td>
<td>This field is visible only if the data type is Choice or Likert Scale.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Randomizing answer options may make a question confusing. In general, only randomize answer options that do not follow a logical order.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Check box that makes the question mandatory (selected) or optional (cleared) on survey questionnaires. Users cannot submit questionnaires until they provide valid responses to all mandatory questions, which are denoted by a red field status indicator.</td>
</tr>
<tr>
<td></td>
<td>This field is visible only when the Depends on field is empty and the data type is not Checkbox. Questions that depend on other questions and check box questions cannot be mandatory.</td>
</tr>
<tr>
<td>Allow not applicable</td>
<td>Check box that determines whether to include a Not Applicable answer option for this question on survey questionnaires. User responses of Not Applicable are excluded from results calculations.</td>
</tr>
<tr>
<td></td>
<td>This field is visible only if the data type is Choice, Likert Scale, Template, or Yes/No.</td>
</tr>
<tr>
<td>Allow Additional Information</td>
<td>If selected, the Additional Information Label field is enabled. The Additional Information Label field value is displayed as a field on the survey response page to provide additional information for a question.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This is not applicable for the String and Template data types.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Depends on</td>
<td>Setting used to make this a conditional question, meaning that it only appears when users answer another question a certain way. To make a question depend on another question, select an existing question from the list, which displays Checkbox, Choice, Template, and Yes/No questions of the same category as this question. Then, use the Displayed when field to set the conditions that cause this question to appear on surveys. The system prevents the creation of recursive dependencies between questions. For example, if Question A depends on Question B, Question B cannot depend on Question A.</td>
</tr>
<tr>
<td>Displayed when</td>
<td>Answer options for the selected Depends on question which, when chosen on surveys, display this question. This field is visible and required only when the Depends on field is set.</td>
</tr>
<tr>
<td>Min</td>
<td>Smallest numerical value to be used as an answer option for this question. This field is visible and required only if the data type is Choice, Likert Scale, Number, or Percentage.</td>
</tr>
<tr>
<td>Max</td>
<td>Largest numerical value to be used as an answer option for this question. This field is visible and required only if the data type is Choice, Likert Scale, Number, or Percentage.</td>
</tr>
<tr>
<td>String option</td>
<td>Selection that determines what kind of response text box appears for this question on survey questionnaires. This field is visible and required only if the data type is String.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Source Field</td>
<td>Source table field that appears as a dynamic value for the question in a triggered survey. When this field value is selected, a ${param} placeholder is added at the end of the question label.</td>
</tr>
<tr>
<td></td>
<td>Note: You can move this placeholder anywhere in the question label.</td>
</tr>
<tr>
<td></td>
<td>When a user takes the survey, the question with dynamic value is included in the survey instance and ${param} placeholder is replaced with the source field value.</td>
</tr>
<tr>
<td></td>
<td>If the record table specified in the trigger condition does not match the source table specified for the survey, or if the system fails to get the dynamic value from the source record, the ${param} placeholder is not replaced by any value and is displayed as is in the question.</td>
</tr>
<tr>
<td></td>
<td>For example, if the survey is triggered from a PRB record and the survey question is configured with a dynamic value from Incident, the ${param} placeholder in the survey question label is not replaced by any dynamic value and is displayed as is.</td>
</tr>
<tr>
<td></td>
<td>Note: When survey questions are translated to other languages by a survey admin, the ${param} placeholder should not be translated.</td>
</tr>
<tr>
<td>Allow Sentiment Analysis</td>
<td>Includes this question for the sentiment analysis of a survey.</td>
</tr>
<tr>
<td></td>
<td>Note: This field is available only for String type questions.</td>
</tr>
<tr>
<td>Related Lists</td>
<td>Answer options for this question.</td>
</tr>
<tr>
<td>Assessment Metric Definitions</td>
<td>This related list is available only if the Data type is Choice or Likert Scale.</td>
</tr>
</tbody>
</table>

6. Save the record.

**Note:**

- Be sure to create answer options if you select the Choice or Likert Scale data type.
• You cannot delete a survey question (metric) with user responses. To delete a survey question with user responses, you should delete the responses, and then delete the survey question.

Survey question data types
You must choose a data type for each survey question. The data type determines the format of the question and the kind of data that is collected on survey questionnaires.

The following data types are available for surveys:

Attachment data type

On questionnaires, users can attach one or more files to a question.

Users click the Manage Attachments icon and select one or more files in the Attachments pop-up window to attach to the question. From this window, users can:
- View a list of the attached files.
- View an attached file in a separate window.
- Rename an attached file.
- Add or delete files

Once a survey has been submitted, attachments cannot be updated or deleted.

Any type of file supported by the platform can be attached to a question. One or more files can be attached a question while taking a survey or completing an assessment.

The assessment administrator can see the attachments associated with an individual question as well as those associated with the survey.

See Administering Attachments for more information.

Boolean data type

On questionnaires, users select a check box beside a statement or leave it cleared.

If you select Boolean, you must fill in the Scale definition field. Select High if it is best when users select the check box.

Choice data type

On questionnaires, users select a value from a list of choices.
If you select Choice, you must fill in the Scale definition field and create answer options. Select High for the scale definition if the answer option with the largest metric definition Value is best.

**Note:** The system sets the Min and Max fields automatically based on the Value settings for the associated metric definitions.

### Date and Date/Time data types

The Date and Date/Time data types are similar.

- **Date:** On questionnaires, users select a date.

- **Date/Time:** On questionnaires, users select a date and time.
Likert Scale data type

On questionnaires, users select a multiple choice value from a custom Likert scale. Each answer option is represented by a radio button on the scale. A Likert scale question that evaluates an application’s ease of use might have the answer options Easy, Average, and Difficult.

If you select Likert Scale, you must fill in the Scale definition field and create answer options. Select High for the scale definition if the answer option with the largest metric definition Value is best.

Note: The system sets the Min and Max fields automatically based on the Value settings for the associated metric definitions.

Number data type

On questionnaires, users enter a number.
If you select Number, you must fill in these additional fields:

- Scale definition: Select High if a larger number is better, such as for a question that measures the number of sales made in a quarter.
- Min and Max: Enter the smallest and largest numbers users can enter. State the range of acceptable answers in the question text.

Percentage data type

On questionnaires, users enter a number.

If you select Percentage, you must fill in these additional fields:

- Scale definition: Select High if a larger percentage is better, such as for a question that measures the percentage of work an agent has completed.
- Min and Max: Enter the smallest and largest numbers users can enter. Generally 0 and 100 are appropriate minimum and maximum values. If you choose values other than 0 and 100, it is usually best to state the range of acceptable answers in the question text.

Reference data type

On questionnaires, users select a value from a list that is generated from a specified reference table. The response field supports auto-completion.

Note: Reference qualifiers are not supported.

For example, a user could select a user name in response to a question if you specify User [sys_user] as the reference table.
String data type

On questionnaires, users enter text. When you select String, the String option field appears. Select one of the following options to determine how the string field appears on questionnaires:

- Figure 477: Single line
Template data type

On questionnaires, users select a value from a predefined series of answer options. To use this data type, a question template must be defined.

If you select Template, you must fill in these additional fields:

- Template: Select a template.
- Scale definition: Select High if the answer option with the largest template definition Value is best.

Yes/No data type

On questionnaires, users select Yes or No from a list.

If you select Yes/No, you must fill in the Scale definition field. Select High if Yes is the best answer.
**Image Scale data type**

On questionnaires, users select an image from a predefined set of images as their response. Image scale questions can also be used in a template for better performance with surveys that have the same type of answer options.

Five emojis, similar to the Likert scale (very dissatisfied to very satisfied) are provided. However, you can upload additional images in JPG, PNG, or GIF format. Two images can be uploaded, one for selected case and another for unselected case. Larger size images are reduced to 64 x 64 pixels.

The result behavior depends on the presence of uploaded images. If no selected image is uploaded, then the question shows up blank.

<table>
<thead>
<tr>
<th>Selected image</th>
<th>Unselected image</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Unselected image loads. Clicking on the image changes it to the selected image.</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
<td>Selected image loads with 50% opacity. Clicking on the image changes the opacity to 100%.</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>A blank placeholder box is displayed.</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>A blank placeholder box is displayed.</td>
</tr>
</tbody>
</table>

**Note:** N/A option is not supported for image scale type question.

**Multiple selection data type**

On questionnaires, users can select multiple check boxes indicating all answers that apply. For instance, a user can be instructed to “Select all that apply” in a multiple selection question.
Ranking data type

On questionnaires, users can select a different order number for each option to rank them. Drag-and-drop functionality is also supported, which allows a user to either fill in the number, or simply drag an option.

1. Please rate following device in order of importance.

One order number cannot be selected twice. This question can be mandatory and it can also be dependent on a parent question, but not vice versa.

Survey question template
Question templates define reusable sets of answer options for survey questions.

Question templates define reusable rating scales for answering questions, where each answer option on the scale is a template definition. For example, the template named Satisfaction represents a satisfaction
scale and contains the following template definitions: Very Satisfied, Satisfied, Neutral, Dissatisfied, and Very Dissatisfied.

Figure 480: Template definition

Templates are available for survey questions that have Data type set to Template. The following question templates are available in the base system. You can create or update a template as described in Create a survey question template on page 2518.

Table 1066: Default question templates

<table>
<thead>
<tr>
<th>Name</th>
<th>Template definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount</td>
<td>None, Few or little, Average amount, Many, Quite a lot</td>
</tr>
<tr>
<td>Complexity</td>
<td>Very Complex, Complex, Moderate, Simple, Very Simple</td>
</tr>
<tr>
<td>Frequency</td>
<td>Never, Seldom, Sometimes, Most of the time, All of the time</td>
</tr>
<tr>
<td>Likert 5</td>
<td>Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree</td>
</tr>
<tr>
<td>Quality</td>
<td>Very Poor, Poor, Average, Good, Very Good</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>Very Dissatisfied, Dissatisfied, Neutral, Satisfied, Very Satisfied</td>
</tr>
<tr>
<td>Size</td>
<td>Very Small, Small, Average, Large, Very Large</td>
</tr>
</tbody>
</table>

Create a survey question template

You can create and administer question templates.

Role required: admin or survey_admin

Changes to a survey, such as the modification of question templates, apply to existing survey instances immediately. Templates that you create are available for use with both surveys and assessments.

1. Navigate to Survey Templates.
   Each template is stored as a record on the Assessment Metric Template [asmt_template] table.
2. Click New.
3. Enter a Name.
4. Right-click the form header and click Save.
5. In the Assessment Template Definitions related list, click New.
   Create a template definition for each answer option you want to appear on a question.
6. Complete the form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display</td>
<td>Enter the text to appear as the answer option.</td>
</tr>
<tr>
<td>Value</td>
<td>Enter a numeric value, greater than or equal to zero, to which the answer option equates. Values are used in results calculations. When you view questions that use templates, answer options appear in order from smallest to largest Value. Each template definition for a given template must have a unique Value.</td>
</tr>
</tbody>
</table>

7. Click Update.

Update min and max values to match templates

If you use survey result calculation data, ensure that the Min and Max values for a question that uses a template are equal to the smallest and largest template definition Value.

Role required: admin or survey_admin

When you create a question of the Template data type, the system sets the Min and Max fields based on the template definition values. The fields for existing questions are not updated if you add a new template definition to a template or if you update the Value of an existing template. If the new Value is less than the minimum value or greater than the maximum value of any questions that use the template, update the questions accordingly.

1. Navigate to Survey Questions.
2. Configure the list to show the Min and Max columns.
3. Add the following list filter condition: [Template] [is] [<select the template you updated>].
4. Ensure the Min and Max values match the smallest and largest template definition Value for the selected template.
   If the values do not match, edit the Min and Max values directly from the list.

   **Note:** When the data type is Template, a UI policy prevents the editing of Min and Max from the form.

Create or modify answer options

You must create answer options, called metric definitions, for survey questions that have Data type set to Choice or Likert Scale.

Role required: admin or survey_admin

Changes to a survey, such as the addition or modification of answer options, apply to existing survey instances immediately.

1. Navigate to Survey Questions.
2. Open a choice or Likert scale survey question.
3. In the Assessment Metric Definitions related list, open a metric definition or click New.
   Each answer option is stored as a record on the Assessment Metric Definition [asmt_metric_definition] table.
4. Complete the Assessment Metric Definition form.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display</td>
<td>Text to appear as the answer option.</td>
</tr>
<tr>
<td>Value</td>
<td>Numeric value, greater than or equal to zero, to which the answer option equates. Values determine the order in which answer options appear. See the example below. Values are also used to calculate survey results. Each metric definition for a given question must have a different Value.</td>
</tr>
</tbody>
</table>

5. Click Submit.

On survey questionnaires, the answer options for a question appear in order from smallest to largest Value. For example, consider the survey question How do you feel? with the answer options Good, Neutral, and Bad. The following table shows the answer option order based on the Value.

<table>
<thead>
<tr>
<th>Answer option</th>
<th>Value</th>
<th>Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>1</td>
<td>First</td>
</tr>
<tr>
<td>Neutral</td>
<td>3</td>
<td>Second</td>
</tr>
<tr>
<td>Bad</td>
<td>5</td>
<td>Third</td>
</tr>
</tbody>
</table>

If you use survey result calculations, ensure the question Scale definition is set appropriately based on the answer options. In the previous example, if you want the answer option Good to earn the highest score, the scale definition should be Low because Good has the smallest value.

*Change the order of survey questions*

You can easily reorder survey questions at the category level or the question level.

**Role required: admin or survey_admin**

You can change the order in which the questions in one category appear relative to those in other categories for the same survey definition. If you add a new question manually after you create other questions, you may want to change the order of questions.

When you create questions using the survey creator, the system sets the Order field for the first question to 101, the second to 102, and so on. After you create a new question outside of the survey creator, the Order is set to 100 by default, which means it appears before all questions generated by the survey creator.

1. Navigate to Survey View Surveys and open the appropriate survey definition.
2. In the Metric Categories related list, edit the values in the Order column.
3. To change the order of questions within a category, complete the following steps.
   a) Open the Assessment Metrics related list.
b) Edit the values in the Order column.

4. Click Update.

Survey trigger conditions

Trigger conditions specify when to send a particular survey and the persons to send it to.

Survey administrators can use trigger conditions to configure the system to generate a survey instance each time a specified action occurs on a specified table, for example, when an incident or change request closes. The system sends the survey to users that are related to the triggering record, for example, incident callers or change request assignees. You can choose to send a survey every time the condition is met, or you can set a probability for the system to send a survey at random when the condition is met.

Trigger conditions are ideal for sending transactional surveys. Transactional surveys generally measure satisfaction with a recent experience, such as closing an incident or purchasing an item.

### Note:
Trigger conditions are comparable to survey conditions in legacy surveys. If you migrate a legacy survey that has survey conditions, ensure that the survey conditions are deactivated before you recreate them as trigger conditions.

**Configure a trigger condition for a survey**

You can configure trigger conditions to specify when to send a particular survey and the persons to send it to.

Role required: admin or survey_admin

1. Navigate to SurveyTrigger Conditions.
2. Click New.

### Note:
Do not specify particular users for a triggered survey because only the specified users are allowed to take the survey.

3. Complete the form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment</td>
<td>Survey to send.</td>
</tr>
<tr>
<td>Table</td>
<td>Table to run the trigger condition on. You can select only tables in the current application scope. For example, to send a survey whenever an incident closes, select the Incident [incident] table.</td>
</tr>
<tr>
<td>User field</td>
<td>Field that stores the users you want to send the survey. You can select any field, on the selected table or on a referenced table, that references the User [sys_user] table. Use the tree picker to select a field.</td>
</tr>
</tbody>
</table>

### Note:
To avoid requiring users to log in to take a survey with a trigger condition, set the survey to Public.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeat interval</td>
<td>Minimum period that must pass before the trigger condition can resend the survey to the same user. For example, assume the repeat interval is set to 30 days. Even if the same user qualifies for multiple surveys from this trigger condition, the system can send only one survey every 30 days.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Ensure that the Schedule period of the selected survey definition is set to No Limit. If the schedule period is set to a different value, it prevents the trigger condition from sending surveys as expected.</td>
</tr>
<tr>
<td>Application</td>
<td>[Admin only] Application is set to Global.</td>
</tr>
<tr>
<td>Active</td>
<td>Check box that determines whether this trigger condition is active (selected).</td>
</tr>
<tr>
<td>Business rule</td>
<td>[Admin only] Business rule the system creates to monitor the selected table. When the condition is met, the business rule sends the survey to the correct user. No configuration is necessary for this business rule.</td>
</tr>
<tr>
<td>Trigger randomly</td>
<td>Check box that determines whether to send the survey to the appropriate user every time the condition is met (cleared) or only a percentage of the time (selected).</td>
</tr>
<tr>
<td>Probability (%)</td>
<td>Approximate probability that the survey is sent each time the condition is met. For example, if the probability is set to 50, the system sends the survey approximately 50% of the time the conditions are met. There are no repeat interval restrictions is assumed. This field is visible and required only when Trigger randomly is selected.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Related Field 1- 4</td>
<td>Field that contains a value you want to store for reporting purposes. You can pick any reference field on the selected table. When the trigger condition generates a survey instance, the system stores the value from the triggering record. Specify up to four fields. For example, select the Incident table, Assigned to and Problem as related fields. The system stores the assigned user and problem associated with the incident as Related record 1 and Related record 2 in the survey instance record. To view the fields, configure the form for any survey instance.</td>
</tr>
<tr>
<td>Description</td>
<td>Summary information to identify the trigger condition.</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong>: For a triggered record, the table title is used for the survey description.</td>
</tr>
<tr>
<td>Condition</td>
<td>Condition builder that defines the criteria that must be true to send the survey. For example, to send a survey whenever an incident closes, create the condition [State] [is] [Closed].</td>
</tr>
</tbody>
</table>

You can also create a trigger condition directly from the survey creator. If you select Certain users can take this survey, based on conditions in the Survey User Access section, the Trigger Condition form opens automatically when you click Save as Draft or Publish.
<table>
<thead>
<tr>
<th><strong>Trigger Condition</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assessment</strong></td>
<td>Service Desk Satisfaction Survey</td>
</tr>
<tr>
<td><strong>Table</strong></td>
<td>Incident (Incident)</td>
</tr>
<tr>
<td><strong>User Field</strong></td>
<td>Click to select...</td>
</tr>
<tr>
<td><strong>Repeat Interval</strong></td>
<td>Days: 30, Hours: 00, 00</td>
</tr>
<tr>
<td><strong>Related Field 1</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Related Field 2</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Related Field 3</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Related Field 4</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Send incident caller service desk satisfaction surveys when incidents are closed</td>
</tr>
<tr>
<td><strong>Condition</strong></td>
<td>Add Filter Condition</td>
</tr>
</tbody>
</table>

Add "OR" Clause

Choose field: <br> op: =<br> value: --
**Trigger condition example**

You can send out auto-triggered surveys when an incident is closed or resolved.

A trigger condition is configured as follows:

- Assessment: Service Desk Satisfaction Survey
- Table: Incident [incident]
- User field: Caller
- Repeat interval: 30 days
- Active: true
- Trigger randomly: false
- Related Field 1: Assigned to
- Related Field 2: Problem
- Condition: [State] [is] [Closed] [or] [State] [is] [Resolved]

Fannie Steese is the caller on incident INC00004305 that is assigned to Boris Catino, a service desk technician. Boris creates PRB010101 based on Fannie's complaint and closes the incident. The system creates a survey instance assigned to Fannie so she can rate her satisfaction with the incident experience.

Because two related fields were selected as part of the trigger condition, the survey instance stores the following information from the incident:

- User (Related Field 1): Boris Catino
- Problem (Related Field 2): PRB010101
- Task (automatically created): INC00004305

Because the task field is automatically populated, UI-based filtering by dot-walking on incidents (or any task-based table) is supported when creating a report on survey results. For example, you can query all survey instances related to incidents assigned to a group (survey reports on all incidents assigned to networking group, for instance).

---

**Note:** Even though the trigger condition is set to be triggered each time that the conditions are met, the Repeat interval setting ensures that Fannie does not receive another survey for another of her incidents closes within 30 days of the first incident.

---

**Survey report example based on task field**

One of the most common use cases for Surveys is to send out an auto-triggered survey when an incident, request, or task is closed. Once you get the survey results back, you can filter the results by users and groups related to the ticket, such as Assignment Group, or Assignee.

Filtering the survey results provides more detail on how people and teams are performing based on ticket data. Since this information is automatically captured, you can dot-walk while filtering the data (instead of utilizing a related field on the Survey trigger condition form, as previously required).

<table>
<thead>
<tr>
<th>Number</th>
<th>Metric type</th>
<th>Due date</th>
<th>State</th>
<th>Assigned to</th>
<th>Trigger table</th>
<th>Trigger ID</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWST0012001</td>
<td>Customer Satisfaction Survey</td>
<td>2016-09-20</td>
<td>Ready to take</td>
<td>System Administrator</td>
<td>Incident [incident]</td>
<td>Incident: INC00012008</td>
<td>INC00012008</td>
</tr>
</tbody>
</table>
To create a report on incident-triggered survey responses by Assignment group, set up the report on the Task Assessment Details by navigating to Reports View/Run and clicking Create a report.

Survey distribution

There are several ways for survey administrators to distribute surveys to users.

Surveys are distributed using any of the following methods.

- Send survey invitations to users
- Share a survey URL that opens the survey directly.
- Create a module that opens a survey.

Send survey invitations to users
You can send survey invitations using the Assign Survey or Send Invitations buttons on the Survey Definition form.

Role required: admin or survey_admin

Use the Send Invitations button to immediately assign survey instances to each survey user that is listed in the survey definition. Use the Assign Survey button to assign a survey instance to any one user at a time.

Each of the buttons generates survey instances assigned to the appropriate users. In addition, if the instance is configured to send email, the system generates survey notifications. For either button to be available, the survey definition must meet all of the following conditions.

- Active check box is selected.
- State is Published.
- Survey is associated with at least one question.

**Note:** You (or a trigger) can send more than one instance of a survey to a user at any time.

1. Navigate to Survey View Surveys.
2. Select an active, published survey.
3. Complete one of the following actions.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assign a survey to users listed in the Survey Users related list</td>
<td>Click Send invitations.</td>
</tr>
</tbody>
</table>
### Assign a survey to any user

Click Assign Survey and select one or more users, and then click OK.

The system creates a survey instance assigned to the user or users, assuming the user is eligible to receive a new survey instance. When you use the Assign Survey button, the selected user is not saved as a survey user.

### Survey URLs

You can distribute a survey by giving survey users a survey URL.

Survey administrators can obtain one of the following types of URLs:

- A general URL for a survey, which users can open to take the survey questionnaire. The following process occurs.
  - When someone opens the URL, the system ensures that the person is logged in. It then searches for an instance of the associated survey that is assigned to the logged-in user.
  - If a survey instance is found, the appropriate action occurs based on the State of the survey instance (see table). If there are multiple active survey instances (Ready to take or In progress), the instance with the earliest due date opens.
  - If no survey instance is found, the system creates a new instance for the survey, assigns it to the user, and opens the survey questionnaire.

- A URL for a specific survey instance, which the assigned user can open to take the survey questionnaire. The following process occurs.
  - When someone opens the URL, the system ensures the person is logged in as the user the survey instance is assigned to. Only the assigned user can access the survey questionnaire.
  - The appropriate action occurs, depending on the State of the survey instance (see table).

### Table 1070: Survey states

<table>
<thead>
<tr>
<th>Survey instance state</th>
<th>Action upon opening URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ready to take: User has not saved any responses.</td>
<td>The survey questionnaire appears for the user to begin. The user can save or submit responses.</td>
</tr>
<tr>
<td>In progress: User has saved at least one response.</td>
<td>The survey questionnaire appears for the user to continue. Any previously saved responses are displayed. The user can save or submit responses.</td>
</tr>
<tr>
<td>Complete: User has submitted all required responses.</td>
<td>If the schedule period is No Limit or if the period restriction has expired, the survey questionnaire for a new survey instance appears for the user to begin. If the schedule period restricts the number of times a user can take the same survey, and the period restriction has not expired since the user last completed survey, an error message appears.</td>
</tr>
</tbody>
</table>

If someone opens a URL for an unpublished or deactivated survey, an error message appears.
Obtain and distribute a general survey URL

You can distribute a general survey URL to allow any eligible user to open a survey questionnaire.

Role required: admin or survey_admin

The general URL is available on the Survey Definition form and on the survey creator. You can also email the URL for a public survey that is published.

1. Navigate to Survey View Surveys.
2. Open a survey definition from the Assessment Metric Types list.
3. To view or copy the URL, click the View Survey URL related link.
   This related link is visible only if the survey definition is Active.
4. To distribute the URL to users, paste the copied URL as desired, or click the Email button to send via email.
   The Email button is visible only for a public survey that is published.

When a survey user clicks the general survey URL, the system creates a survey instance for the survey user as long as the user does not have an instance in the Ready to take state. The system is configured by default to send an email notification when a survey instance is generated.

As a result, the survey user receives a second notification in addition to the notification that you sent with the general survey URL. This may confuse the survey user. To avoid this issue, you can deactivate auto-notification.

Deactivate auto-notification for surveys

When you send a survey notification with a general survey URL to a survey user, the user may receive a second system-generated notification. To avoid this issue, you can deactivate auto-notification.

Role required: admin or survey_admin

1. Navigate to System Notification Email Notifications.
2. Open the Survey User Invite notification.
3. Configure the form to add the Send to event creator check box to the Who will receive section.
   The Send to event creator check box is selected by default.
4. Clear the Send to event creator check box.
   The system will no longer send auto-notification messages to survey users.

Obtain a survey instance URL

You can distribute a survey instance URL to allow the assigned user to open a survey questionnaire.

Role required: admin or survey_admin

The survey instance URL is available on the survey instance record.

1. Navigate to Survey Survey Instances.
2. Open the instance for the survey.
3. To view or copy the URL, click View Instance URL related link.
   The related link is available only when the survey instance State is Ready to take or In progress and the associated survey definition is Active.
4. In the dialog box, select and copy the URL then click OK or Cancel.
5. Distribute the URL to the assigned user.

Test a survey URL

When there are survey users associated with a survey, the survey is restricted so only those users can use the survey URL. You can test the survey URL to ensure it is restricted.
Role required: admin or survey_admin

1. Navigate to Survey View Surveys and open a survey for which you are not a survey user.
2. Under Related Links, click View Survey URL.
3. Copy the URL and click OK or Cancel.
4. Navigate to the URL.
   You see a message that you are not authorized to take the survey.

*Create a survey module*
You can create a module that opens a survey.

Role required: admin or survey_admin

When a user clicks a survey module, the system performs one of the following actions, depending on the configuration options for the survey and other factors.

- Creates a new survey instance
- Opens an existing survey instance
- Displays an error message.

1. Perform the appropriate action for your version of the UI:
   - UI16: Point to the application menu that contains the module to which you want to add the survey module and click the edit application (pencil) icon.
   - UI15: Right-click the application menu you want to add the module to and select Edit Application Menu

2. In the Modules related list, click New.
3. Complete the following fields.
   - Link type: Assessment
     Do not select Survey, which is used for legacy surveys only.
   - Assessment: Select the survey you want the module to open.

4. Complete and save the form.

*Sharing surveys: export and import*
You can export a survey and then import it to a different ServiceNow instance.

**Note:** Update sets are available in the Helsinki release and should be used to move data from one instance to another. For information about update sets, see System update sets.

The system exports a single XML file that contains a survey definition [asmt_metric_type] and the associated records, including the following.

- Assessment Metric Template [asmt_template]
- Assessment Template Definition [asmt_template_definition]
- Metric definitions [asmt_metric_definition] (survey question answer options)
- Scheduled Jobs associated with the Survey [sys_trigger]
- Survey categories [asmt_metric_category]
- Survey questions [asmt_metric]
- Survey users [asmt_m2m_category_user]
- Trigger Condition [asmt_condition]

*Export a survey*
You can export a survey and then import it to another instance.
Role required: admin, survey_reader, or survey_admin

For information about update sets, see System update sets.

1. Navigate to Survey View Surveys.
2. Right-click the name of a record to show the context menu.
3. Select Export Assessment.
4. If applicable, follow the prompt in your browser to save the XML file.

**Import a survey**

You can import a survey that has been exported as an XML file. The exported XML file does not contain result data.

Role required: admin or survey_admin

---

**Note:** Update sets are available in the Helsinki release and should be used to move data from one instance to another. For information about update sets, see System update sets.

---

1. Verify that the target instance has assessments enabled.
2. Follow the steps in Import an XML file to import the assessment.

**Use update sets for surveys and assessments**

Use an update set to capture changes to surveys and assessments.

Role required: admin or survey_admin

When developing surveys and assessments, you can use an update set to capture the changes and move them from a development instance to a production instance. Once an update set is created and marked current, all of the updates to the following tables are recorded in the update set.

The following tables are now update set enabled and also extend the application file:

- Assessment Metric Templates [asmt_template]
- Assessment Template Definitions [asmt_template_definition]
- Assessment Metric Definitions [asmt_metric_definition]: survey question answer options
- Schedule [sys_trigger]: scheduled jobs associated with the survey
- Assessment Metric Categories [asmt_metric_category]: survey categories
- Assessment Metrics [asmt_metric]: survey questions
- Assessment Category Users [asmt_m2m_category_user]: survey users
- Trigger Conditions [asmt_condition]

**Sentiment analysis for surveys**

You can use sentiment analysis to determine whether user responses for a survey are considered positive, negative, or neutral.

Activate the Sentiment Analysis (com.snc.sentiment_analysis) plugin.

For a survey, you can select questions that should be used for analysis. The survey responses of these questions are sent to the thirdparty platforms for analysis through the specified connector configurations.

---

**Note:** You can only use string type questions for sentiment analysis.

---

The sentiment analysis results are displayed under Survey Question Sentiment Results. The sentiment label is based on the normalized score:
Table 1071: Sentiment label

<table>
<thead>
<tr>
<th>Normalized score</th>
<th>Sentiment label</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1 to 0</td>
<td>Negative</td>
</tr>
<tr>
<td>0</td>
<td>Neutral</td>
</tr>
<tr>
<td>0 to 1</td>
<td>Positive</td>
</tr>
</tbody>
</table>

*Configure a sentiment connector*

Specify the service URL and other configuration information for third party APIs that are used for sentiment analysis.

Role required: admin

1. Change the scope of the current session to Sentiment Analysis.
2. Navigate to Sentiment Analysis Sentiment Connector Configurations.
3. Add or edit the connector configuration for a third party vendor such as Google, IBM Watson, and MS Azure.

*Note:* By default, placeholders are available for configuring connectors for Google, IBM Watson, and MS Azure.

Table 1072: Sentiment connector fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the sentiment analysis connector configuration.</td>
</tr>
<tr>
<td>Active</td>
<td>Check box to activate the connector configuration.</td>
</tr>
<tr>
<td>Credential Alias</td>
<td>Credential alias associated with the connector configuration. It has a reference to the system level table (sys_alias_list).</td>
</tr>
<tr>
<td>Default</td>
<td>Check box to make this as the default connector configuration.</td>
</tr>
<tr>
<td>Description</td>
<td>Description of the connector configuration.</td>
</tr>
<tr>
<td>Script</td>
<td>Script to call the Sentiment Analysis API and the normalize the values.</td>
</tr>
</tbody>
</table>

4. Configure the connector credentials
   a) Open the record referred in the Credential Alias field.
   b) Under the Connections tab, select the connection.
   c) In the Connection URL field, enter the value.
   d) Open the record referred in the Credentials field.
   e) Enter the credential information.

*Note:*
- You should obtain the connection credentials from the respective third-party vendors.
• If the credential is an API key, specify its value. If the credential is basic authentication, that is, user name and password, specify the corresponding information.

f) Select the Active check box and click Update.

5. Select the Active check box for the connector configuration and click Update.

Sentiment analysis properties
You can use the sentiment analysis properties to customize the Sentiment Analysis module.

Table 1073: Sentiment analysis properties

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response time for the outbound call of Sentiment Analysis API (sn_nlp_sentiment.glide.sentiment.transaction.timeout)</td>
<td>Maximum time (milliseconds) expected for executing the outbound call for Sentiment Analysis API before it’s timeout.</td>
</tr>
</tbody>
</table>

Sentiment analysis results
The sentiment analysis results view contains a bar chart that displays the percentage of positive, negative, and neutral results, along with the instance count for each category.

Color indicators
Following are the color indicators in the bar chart:

• Green: Positive
• Red: Negative
• Blue: Neutral

Legacy survey migration
Users with the survey_admin role can migrate legacy survey data to create copies of legacy surveys and their related records in assessment tables. The Survey Management application, which is built on the assessment engine, is available as an alternative to legacy surveys.

The following legacy survey components are migrated:

• Survey masters
• Supported survey questions and question choices
• Survey instances
• Survey responses

Legacy survey conditions are not migrated and must be recreated as trigger conditions.

Note:

• The Legacy Surveys and Legacy Administration modules are available on instances upgraded from a previous release but not available for new instances. Customers using legacy survey or survey wizard should plan to migrate to the Survey Management application to create modern and high quality surveys for their users.
• The following legacy survey plugins are inactive by default, and are available upon request:
  • Best Practice - Task Survey Management (ID: com.snc.bestpractice.task_survey)
Migrate a legacy survey
Migrate a legacy survey and its related records to take advantage of a more powerful feature set.

Role required: admin or survey_admin

To avoid timing out for very large surveys, you can disable the transaction quota. See Transaction quotas.

1. Navigate to SurveyLegacy SurveysMasters.
   The list of legacy survey masters appears. By default, the list shows only survey masters that have not been migrated. To show all survey masters, remove the Assessment is empty breadcrumb.

2. Open a survey and click the Migrate to New Survey Management related link or Migrate to New Survey Management in the title bar.
   A dialog box describes what happens when you migrate the survey. Note that certain types of survey questions cannot be migrated.

3. Click OK.
   The system generates records on assessment tables based on the survey master, eligible questions and choices, results, and other related survey components. The original survey components are unaffected.
   System messages may appear at the top of the Survey form to notify you of questions that could not be migrated and to advise you to review migrated Multiple Choice questions.

4. Click the reference icon beside the Assessment field to view the new survey definition.

5. Remove survey users from the assessment survey if you want all users to be able to take it.
   When you migrate a survey, any users who have taken it are automatically associated with the assessment survey and become survey users. When there are survey users associated with an assessment survey, only those users can take it.

6. Deactivate any survey conditions associated with the survey by completing the following steps.
   a) Navigate to Survey Legacy Administration Survey Conditions.
   b) In the Active column, ensure the value is false for any survey conditions that reference the migrated survey.

7. Navigate to Survey Administration Trigger Conditions to create new trigger conditions for the migrated survey.

The Migrate to Assessment related link on the legacy survey record becomes unavailable after the migration. However, if you delete the record referenced in the Assessment field, the related link reappears and you can migrate the legacy survey again.

Survey question migration
Before you migrate a legacy survey, understand that some legacy survey questions cannot be migrated due to incompatible question types.

Legacy survey questions are migrated from the Survey Question [survey_question_new] table to the Assessment Metric [asmt_metric] table. In legacy surveys, the Type field on the Survey Question table determines how the question renders on the survey questionnaire. In assessment surveys, the Data type field on the Assessment Metric table serves a similar purpose. Certain legacy survey types are not supported in assessment surveys.

The following table shows the conversion path for each legacy survey question type to an assessment data type, if there is one.
### Table 1074: Survey question migration

<table>
<thead>
<tr>
<th>Legacy survey type</th>
<th>Assessment data type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Break</td>
<td>Not available</td>
</tr>
<tr>
<td>CheckBox</td>
<td>Checkbox</td>
</tr>
<tr>
<td>Date</td>
<td>Date</td>
</tr>
<tr>
<td>Date/Time</td>
<td>Date/Time</td>
</tr>
<tr>
<td>HTML</td>
<td>Not available</td>
</tr>
<tr>
<td>Label</td>
<td>Not available</td>
</tr>
<tr>
<td>List Collector</td>
<td>Not available</td>
</tr>
<tr>
<td>Lookup Multiple Choice</td>
<td>Not available</td>
</tr>
<tr>
<td>Lookup Select Box</td>
<td>Not available</td>
</tr>
<tr>
<td>Macro</td>
<td>Not available</td>
</tr>
<tr>
<td>Macro with Label</td>
<td>Not available</td>
</tr>
<tr>
<td>Multi Line Text</td>
<td>String (String option set to Multiline)</td>
</tr>
<tr>
<td>Multiple Choice</td>
<td>Likert Scale</td>
</tr>
<tr>
<td>Numeric Scale</td>
<td>Number</td>
</tr>
<tr>
<td>Reference</td>
<td>Not available</td>
</tr>
<tr>
<td>Select Box</td>
<td>Choice</td>
</tr>
<tr>
<td>Single Line Text</td>
<td>String (String option set to Single line)</td>
</tr>
<tr>
<td>UI Page</td>
<td>Not available</td>
</tr>
<tr>
<td>Wide Single Line Text</td>
<td>String (String option set to Single line wide)</td>
</tr>
<tr>
<td>Yes / No</td>
<td>Yes/No</td>
</tr>
</tbody>
</table>

**Migrated components**

When you migrate a survey, the system maps records from survey tables to assessment tables.

To create a functional survey on the assessment framework, the system converts survey records to the most logical equivalent assessment survey records. This may mean multiple assessment survey records represent one legacy survey record.

### Table 1075: Migrated components

<table>
<thead>
<tr>
<th>Survey component</th>
<th>Assessment survey components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey master [survey_master]</td>
<td>• Survey definition [asmt_metric_type]</td>
</tr>
<tr>
<td></td>
<td>• Assessable record [asmt_assessable_record], for system use only</td>
</tr>
<tr>
<td></td>
<td>• Survey category [asmt_metric_category]</td>
</tr>
<tr>
<td>Survey question [survey_question_new]</td>
<td>• Survey question [asmt_metric]</td>
</tr>
</tbody>
</table>
Survey component | Assessment survey components
--- | ---
Question choice [question_choice] | • Assessment metric definition [asmt_metric_definition]
Survey instance [survey_instance] | • Assessment group [asmt_assessment], for system use only • Survey instance [asmt_assessment_instance]
Survey response [survey_response] | • Survey instance question [asmt_assessment_instance_question] • Survey response [asmt_metric_result] • Category result [asmt_category_result], for system use only

**Migrated question review**

To maintain accurate result calculations, you may need to make minor adjustments to some of the migrated survey records to ensure results are calculated correctly.

**Note:** The assessment engine provides a built-in result calculation feature that converts each survey response to a score between 0 and 10. The configuration required to maintain accurate result calculations is advanced and is not recommended for basic survey implementations. If you do not plan to use result calculation data, ignore the information in this section.

For each legacy question migrated, the system creates a survey question record on the Assessment Metric [asmt_metric] table. For legacy questions of the Multiple Choice and Select Box types, the system also creates a metric definition record, on the Assessment Metric Definition [asmt_metric_definition] table, for each legacy question choice.

**Table 1076: Comparable metric definitions and survey question choices**

<table>
<thead>
<tr>
<th>Survey question choice field</th>
<th>Related metric definition field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text</td>
<td>Display</td>
</tr>
<tr>
<td>Value (can be any string value)</td>
<td>Value (must be a numerical value)</td>
</tr>
<tr>
<td>Order</td>
<td>Value (metric definition with smallest Value is first)</td>
</tr>
</tbody>
</table>

When the system migrates legacy survey question choices, it uses the legacy Order to set each metric definition Value. For the legacy question choice with the smallest Order, the corresponding metric definition Value is set to 1. For the legacy question choice with the next smallest Order, the metric definition Value is 2, and so on.

The Scale definition field on the migrated Survey Question form determines whether smaller or bigger metric definition values equate to a good score in survey result calculations. By default, the scale definition is set to High, meaning bigger values are good. When you migrate a legacy survey, check that the default scale definition makes sense for each question.

For example, the following tables depict a sample migrated question and the metric definitions automatically created for it. Recall that the system uses the order of the legacy survey question choices to set the metric definition value. Excellent has the lowest Order value, so when the system creates a metric
definition for this question choice, the Value is set to 1. In this case the default scale definition value, High, does not make sense, as the system will calculate the worst scores for responses of Excellent.

Table 1077: Legacy question: Please rate the overall quality of your service.

<table>
<thead>
<tr>
<th>Question choice text</th>
<th>Question choice value</th>
<th>Question choice order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>A</td>
<td>100</td>
</tr>
<tr>
<td>Good</td>
<td>B</td>
<td>200</td>
</tr>
<tr>
<td>Fair</td>
<td>C</td>
<td>300</td>
</tr>
<tr>
<td>Poor</td>
<td>D</td>
<td>400</td>
</tr>
</tbody>
</table>

Table 1078: Migrated question: Please rate the overall quality of your service.

<table>
<thead>
<tr>
<th>Metric definition display</th>
<th>Metric definition value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>1</td>
</tr>
<tr>
<td>Good</td>
<td>2</td>
</tr>
<tr>
<td>Fair</td>
<td>3</td>
</tr>
<tr>
<td>Poor</td>
<td>4</td>
</tr>
</tbody>
</table>

If there are no Order values for the legacy survey question choices, the system sets each corresponding metric definition Value based on the alphanumeric order of the legacy Text value.

Table 1079: Migrated question: Please rate the overall quality of your service.

<table>
<thead>
<tr>
<th>Metric definition display</th>
<th>Metric definition value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>1</td>
</tr>
<tr>
<td>Good</td>
<td>2</td>
</tr>
<tr>
<td>Fair</td>
<td>3</td>
</tr>
<tr>
<td>Poor</td>
<td>4</td>
</tr>
</tbody>
</table>

You may also need to change the Scale definition setting for other migrated questions. For details, see the scale definition recommendations for each survey question data type.

Quizzes

Quizzes are questionnaires you can assign to one or more users to assess their knowledge of any subject. The quiz functionality is built on the assessment engine and provides many of the same features as assessments and surveys.

Each question is scored, and the overall score indicates the percentage of questions the user answered correctly. A quiz may have categories of questions that are assigned only to some users. You can assign weighting values to individual questions or categories of questions that make them more or less important when calculating the overall score. Quizzes require activation by a system administrator.

- An administrator can create a quiz for any purpose and assign it to a single user or multiple users.
• A quiz can contain one or more categories of questions. Each category can be assigned to users who answer only the questions in that category.
• The system can send email notifications to these users:
  • Recipients: The recipient can receive notification of an assigned quiz, a quiz whose allowed duration is at 50%, and a quiz that is overdue.
  • Recipient's manager: The recipient's manager can receive notification when a quiz is overdue.
  • Quiz manager: The quiz manager can receive notification of an overdue quiz to which he or she is assigned.
• Quizzes can contain questions that are scored or not scored. Unscored questions assess opinions or involve dates and are not counted in the final score. Scored questions specify correct answers and are scored either as 0% or 100%. You can apply a weighting scale to scored questions to establish their relative importance. You can designate questions with these data types as scored questions:
  • Checkbox
  • Choice
  • Duration
  • Likert Scale
  • Numeric Scale
  • Template
  • Yes/No
• A quiz question can be dependent on the response to any scored question. For example, you can create a dependent question requesting additional information that appears only if a recipient answers No to a specific question.

Important terms

The quiz application involves several terms.

<table>
<thead>
<tr>
<th>Table 1080: Terms used in quiz application</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quizzes</strong></td>
</tr>
<tr>
<td><strong>Categories</strong></td>
</tr>
<tr>
<td><strong>Questions</strong></td>
</tr>
</tbody>
</table>
Category user
A category user is the recipient of questions for a specific category. You can select different users to answer the questions for each category.

Templates
A template is a question data type that provides reusable rating scales for answers to questions. For example, the answer template named Satisfaction contains a satisfaction scale ranging from Very Satisfied to Very Dissatisfied.

Quiz roles
The Quizzes application uses these roles. No role is required to take quizzes that are assigned to you.

Table 1081: Quiz roles

<table>
<thead>
<tr>
<th>Role Title [Name]</th>
<th>Role Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>assessment administrator [assessment_admin]</td>
<td>Can administer the Assessments application and all quiz records. Can access all the modules of the Assessments application.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> The itil_admin role and the survey_admin role contain the assessment_admin role</td>
</tr>
<tr>
<td>Administrator [admin]</td>
<td>Can access all aspects of the assessment and survey processes. Only administrators can modify survey notifications, create survey modules, and import surveys.</td>
</tr>
</tbody>
</table>

Set up and administer quizzes

Set up and administer quizzes.

Role required: assessment_admin or admin

1. Create reusable question templates for quizzes.
2. Create the quiz using the Quiz Designer or with forms accessed from the navigation menu.
   The quiz record includes specifics such as duration, notification preferences, a questionnaire introduction, and ending notes displayed to recipients.
3. Edit the default category or create additional categories as needed.
   The system creates a category with the same name as the quiz.
4. Define users for each category.
   These are the recipients who answer the questions in a category. You can define different users for each category.
5. Create the questions for each category.
6. Create the answers for each question and determine if the questions are scored.
   You can create unique answers or select preconfigured answers from a template.
Publish and distribute the quiz. You can send the quiz to a single user or all users in each category.
Review the results from the submitted quizzes in reports and scorecards.

Activate the quiz designer

Administrators can activate the Quiz Designer plugin.
Role required: assessment_admin or admin

1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.
   - If the plugin depends on other plugins, these plugins are listed along with their activation status.
   - If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).
4. If available, select the Load demo data check box.
   - Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.
   - You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.
5. Click Activate.

Quiz Overview module

The Quiz Overview module is a homepage that displays various reports on data such as results for each category and quizzes that are complete, pending, or in progress.
Role required: assessment_admin or admin

Users with the assessment_admin role can view the overview page and refresh, add, delete, and rearrange widgets.

1. Navigate to Quizzes Overview.
2. Click elements within reports to obtain more information. The available reports are:

<table>
<thead>
<tr>
<th>Report</th>
<th>Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes by State</td>
<td>Assessment Instance [asmt_assessment_instance]</td>
</tr>
<tr>
<td>Total Questions by Quiz</td>
<td>Assessment Metric [asmt_metric]</td>
</tr>
<tr>
<td>Questions by Data Type</td>
<td>Assessment Metric [asmt_metric]</td>
</tr>
<tr>
<td>Correct Answers by Assigned User</td>
<td>Metric Results [asmt_metric_result]</td>
</tr>
<tr>
<td>Number of Correct Answers</td>
<td>Metric Results [asmt_metric_result]</td>
</tr>
<tr>
<td>Incorrect Answers by Assigned User</td>
<td>Metric Results [asmt_metric_result]</td>
</tr>
<tr>
<td>Number of Incorrect Answers</td>
<td>Metric Results [asmt_metric_result]</td>
</tr>
</tbody>
</table>
Quiz designer

The quiz designer provides a single interface that users with the assessment_admin role can use to create, edit, and distribute quizzes.

You can also use it to edit existing quizzes and change scoring parameters.

Alternatively, you can use the modules of the assessment engine to create and edit the records that make up a quiz. All quiz records are stored in assessment tables and displayed in Quiz views of those tables. For details, see Create quizzes with forms.

Tools on the Quiz Designer

The quiz designer includes a design canvas, a header bar, and many controls that you can use to create quizzes.

To open the quiz designer, navigate to Quizzes Quiz Designer.

The designer contains the following elements:

- Controls
- Header bar
- Design canvas

Controls

Controls for the supported question data types are available in the Controls palette. Drag and drop a control onto the designer canvas to create a question of that type.
### Table 1082: Question controls

<table>
<thead>
<tr>
<th>Data type</th>
<th>Description</th>
<th>Scored</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attachment</td>
<td>Question with a Manage Attachments icon that allows users to attach one or more files.</td>
<td>Y</td>
</tr>
<tr>
<td>Boolean</td>
<td>Question with a check box or a Yes/No list for user responses.</td>
<td></td>
</tr>
<tr>
<td>Data type</td>
<td>Description</td>
<td>Scored</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------------------------------------------------------------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Choice</td>
<td>List of predefined options. For more information, see the definition for Choices Create quiz questions on page 2354. Multiple correct answers are supported.</td>
<td>Y</td>
</tr>
<tr>
<td>Date</td>
<td>Date field.</td>
<td>N</td>
</tr>
<tr>
<td>Date/Time</td>
<td>Date and time field.</td>
<td>N</td>
</tr>
<tr>
<td>Number</td>
<td>Number field with predefined minimum and maximum values. The default is 1-10.</td>
<td>N</td>
</tr>
<tr>
<td>Percentage</td>
<td>Percentage field with a prescribed range.</td>
<td>N</td>
</tr>
<tr>
<td>Scale</td>
<td>Predefined Likert scale. Answer options appear as radio buttons. Multiple correct answers are supported.</td>
<td>Y</td>
</tr>
<tr>
<td>Numeric Scale</td>
<td>Selectable number scale. The default is 1-5. Answer options appear as radio buttons. Multiple correct answers are supported.</td>
<td>Y</td>
</tr>
<tr>
<td>Image Scale</td>
<td>Predefined set of images. Five emojis similar to the Likert scale (very dissatisfied to very satisfied) are provided. However, you can upload additional images in JPG, PNG, or GIF format. Multiple correct answers are supported.</td>
<td>Y</td>
</tr>
<tr>
<td>String</td>
<td>Single or multiline text field.</td>
<td>N</td>
</tr>
<tr>
<td>Template</td>
<td>Choice list of templates that provide a predefined scale of options. For details, see Configure a template question. Multiple correct answers are supported.</td>
<td>Y</td>
</tr>
<tr>
<td>Reference</td>
<td>Choice list of fields from a specified reference table. This data type does not support reference qualifiers.</td>
<td></td>
</tr>
</tbody>
</table>

**Header Bar**

The header bar contains tabs that display different views and a menu of various functions.

Click one of the following tabs to change the view in the canvas:
Design: Add categories and questions, and configure the properties of each. This is the default view of the canvas when you open the designer.

Configuration: Create introductions and end notes for quizzes, and select a signature.

Availability: Select the recipients for each category in the quiz.

Point to the menu icon ( □□□ ) in the upper right of the quiz designer to select the following options:

- Save: Saves the current quiz.
- Preview: Displays a preview of the quiz as it appears to the recipients.
- Publish: Distributes the quiz to the selected recipients.
- Save and Publish: Saves and distributes the quiz in one step.
- New Quiz: Opens a fresh canvas for a new quiz.
- Load Quiz: Opens a list of existing quizzes that you can select and edit.
- Copy Quiz: Creates a copy of the quiz.

The availability of each option depends on the status of the quiz that is opened in the quiz designer.

Design Canvas

New quizzes open in the Design view. The quiz Name field appears above first category in the canvas. A blank question field appears in the category container.

Create a quiz

When you create a quiz, you can create one or more categories and then add questions to each category.

Role required: assessment_admin or admin

Each category can be assigned to a different user or the same users. You can also customize each question and make it dependent on the response to another question.

Create a quiz using these procedures:

*Create quiz categories*

A category represents a theme for evaluating a specific element of the quiz topic and contains questions pertaining to that theme.

Role required: assessment_admin or admin

When you create a quiz, the system creates a default category, using the name of the quiz. You can use this category, modify it, or create additional categories as needed. To have any results, a category must contain scored questions.

1. Navigate either Quizzes Quiz Designer or Quizzes Quizzes and click Quiz Designer in the list header.
2. Enter the name of the quiz in the Name field. The system uses this name as the name of the quiz and the first category.
3. To configure the category, click the gear icon in its title bar. The Properties dialog box appears. You can change the name of the category, add a description for it, and enter text in the Details field that introduces or explains the category to the recipients. The system updates the category as you type.
4. Click the X icon to close the category properties dialog box and save your settings.
5. To add a new category, click the + icon in the title bar of an existing category.

Create quiz questions
You can create multiple questions for each category but each question can be associated with only one category.

Role required: assessment_admin or admin

The data type that you select for each question determines how it can be answered by quiz recipients.

You can designate questions to be scored. Only scored questions are shown in the quiz results and considered when calculating the category results. You must also specify a correct answer for scored questions.

Note:
To designate a question as scored, you must use Assessment forms. For instructions, see Configure a scored question.

1. In the Design view, drag a data type icon from the Controls palette and drop it into a category container.
2. To configure the question, click in the gear icon in its title bar. The Properties dialog box appears for the question.
3. Fill in the fields on the form, as appropriate.

**Table 1083: Question property fields**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>[Required] Name of the question. Create a concise and easily recognizable name for your question. The system uses this value to identify the question in Assessment Metric lists and in scorecard charts.</td>
</tr>
<tr>
<td>Question</td>
<td>Text to display as the question on quizzes. Enter a clear, straightforward question that is easy to understand.</td>
</tr>
<tr>
<td>Type</td>
<td>[Read-only] Data type selected for this question. See the table in Controls for possible data types.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Active</td>
<td>Check box that determines whether this question is available on a quiz. If a question is marked inactive, it does not appear on quizzes generated after the question becomes inactive.</td>
</tr>
<tr>
<td>Boolean option</td>
<td>Whether a check box or a Yes/No list appears as the option for the Boolean question.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Check box for requiring users to answer the question. Users cannot submit quizzes until they answer all mandatory questions, which are denoted by a red field status indicator.</td>
</tr>
<tr>
<td>String option</td>
<td>Setting for the appearance of a string field in a question. This field is available when the question type is String. The string options are:</td>
</tr>
<tr>
<td></td>
<td>• Single line: Single line text field 40 characters in length that allows strings of any length.</td>
</tr>
<tr>
<td></td>
<td>• String line wide: Full page width text field that allows a single line entry of any length.</td>
</tr>
<tr>
<td></td>
<td>• Multiline: Full page width multi-line text field that allows word wrap and returns.</td>
</tr>
<tr>
<td>Min</td>
<td>Lowest positive whole number that users can enter or select to answer the question. This field is available when the question type is Number, Percentage, or Numeric Scale.</td>
</tr>
<tr>
<td>Max</td>
<td>Highest positive whole number that users can enter or select to answer the question. This field is available when the question type is Number, Percentage, or Numeric Scale.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Allow not applicable</td>
<td>Check box for including Not Applicable as an option for this question. Users can select Not Applicable if they do not have sufficient information to respond to a question. User responses of Not Applicable are excluded from results calculations. This field is available when the question does not have a dependency and the question data type is not Boolean with a check box option.</td>
</tr>
<tr>
<td>Randomize answers</td>
<td>Check box for displaying answer options in a random order whenever the question appears in a quiz. Answer preference is sometimes influenced by the order in which options appear, which can result in biased results. Randomizing options can help prevent this bias. Note: Randomizing options for certain questions may make those questions confusing for users. In general, only randomize options that do not follow a logical order.</td>
</tr>
<tr>
<td>Details</td>
<td>Information about the question that is displayed on the quiz. Include details that help users understand how to answer the question. You can also enter HTML text in this field with the WYSIWYG editor. For example, include HTML to embed links and images.</td>
</tr>
<tr>
<td>Correct answer</td>
<td>Answer option that you want to be selected by users. When you specify a correct answer for a question, the system scores the question. This field is available for all data types except Date, Date/Time, and String. Multiple correct answers are supported for a few data types. See data types.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Choices</td>
<td>Options for a question with a data type of Choice or Scale. The system automatically adds text and values that you can edit for each option. Click the + icon to add an option, or click the X icon to delete an option. By default, the system arranges options in the order established by their values. To change the order, drag and drop the options.</td>
</tr>
<tr>
<td>Dependency</td>
<td></td>
</tr>
<tr>
<td>Displayed when</td>
<td>Condition builder that hides or displays the question depending on the answer to another question in the same category. Select an existing question from the list with a data type of Boolean, Choice, Scale, or Template. Create the condition that must exist for recipients to see the dependent question, using the is or is one of operator. The system prevents recursive dependencies between questions. For example, if Question A depends on Question B, Question B cannot depend on Question A.</td>
</tr>
</tbody>
</table>

4. To create any special conditions that must be met for a question to appear on the quiz, click the Dependency tab. Fill in the fields, as appropriate.

Dependent questions appear on the quiz when a recipient selects a specific answer or combination of answers to another question in the same category

5. Select a question in the Displayed when field. The system selects the appropriate operator and displays the possible answers for the selected question.

6. Select the answers that satisfy the condition. Selected answers are indicated by a check mark.
7. Click X to close the question properties dialog box and save your settings.
8. To add a question with the same data type as an existing question in the category, click the + in the title bar of the existing question.
9. Drag questions to change their order within a category or move them between categories.
10. To delete a question, click the X in its title bar.

*Configure a template question*
You can configure template questions when designing quizzes.

Role required: assessment_admin or admin

1. Drag the Template data type icon into a category container.
2. Click the gear icon in the question title bar to open the template properties dialog box.
3. Select a predefined scale from the list.
Question entry fields appear for that template.

4. Enter one or more questions that are appropriate for the template.
5. Click the arrow to the right of a question to configure its properties. You must provide a name for each question.
6. Click the up or down arrow to move between questions, or click the back arrow to return to the template properties dialog box.

7. Configure the properties for the remaining questions.

8. Click the X icon to close the template properties dialog box and save your settings.

*Configure a scored question*

Only *scored* questions are considered when calculating category and quiz results.

Role required: assessment_admin or admin

A question must have a correct answer specified to be scored. Only results for scored questions are displayed in the *quiz scorecard*.

1. Navigate to Quizzes Quizzes.

2. Open the quiz containing the questions you want to mark as scored.

3. In the Metric Categories related list on the Assessment Metric Type form, select the category for the questions you want to mark as scored.

4. In the Assessment Metrics related list on the Metric Category form, select a question from the list.

5. In the Question Type section of the Assessment Metric form, select the Scored check box.
This check box is not available if the question's data type is not supported for scoring.

6. Select the Correct answer for the question.

**Note:** Multiple correct answers are supported for a few data types. See *Data types for quizzes* on page 2348.

7. Click Update.
8. Repeat the process for all the questions in the category that you want the system to score.
9. Return to the list of metric categories, select another category, and configure scoring for the appropriate questions in that category.

**Configure a quiz**

You can configure an entire quiz.

Role required: assessment_admin or admin

The values you enter and select on this page are applied to the entire quiz.

In the quiz designer, click Configuration and then fill in the fields as described in the table.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>Check box for enabling the distribution of this quiz to recipients.</td>
</tr>
<tr>
<td>Description</td>
<td>Description of this configuration or the quiz to which it is attached.</td>
</tr>
<tr>
<td>Introduction</td>
<td>Introductory content to display on quizzes. You can add a welcome message or background information about the quiz.</td>
</tr>
<tr>
<td>Signature</td>
<td>[Optional] Acknowledgement by a quiz recipient of requirements, admonitions, or expectations related to a quiz.</td>
</tr>
<tr>
<td>Return URL</td>
<td>Destination address of a web page that is presented to users after they submit a completed quiz. When a return URL is configured, the End note content does not appear.</td>
</tr>
<tr>
<td>End note</td>
<td>Content that is displayed to recipients after they submit a completed quiz. You can add a thank you message, follow-up instructions, or other applicable information. End notes are not displayed if a Return URL is specified.</td>
</tr>
<tr>
<td>Duration</td>
<td>Amount of time that recipients are given to complete this quiz, starting from the time that the quiz is generated. The default duration is 14 days.</td>
</tr>
</tbody>
</table>
### Field Description

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manager</td>
<td>Assessment manager for this quiz. These users are only responsible for managing the quiz process and not the results. The system notifies the manager when submissions for this quiz are past due.</td>
</tr>
<tr>
<td>Notify manager if overdue</td>
<td>Check box for sending <em>email notifications</em> to a recipient's manager when that user fails to submit an assigned quiz before the due date.</td>
</tr>
</tbody>
</table>

### Related Links

| Show Benchmarks            | Opens the Benchmarks Dashboard that provides visibility into your key performance indicators (KPIs) and trends.                             |

**Note:**
- This related link is available only for survey_admin, assessment_admin and survey_reader with bm_viewer role.
- You must opt in to Benchmarks to view the dashboard. See *Enable Benchmarks*
- This is applicable only for a published quiz.

---

*Select a quiz recipient*

When the system distributes a quiz, it sends email notifications to the category users and their managers.

**Role required:** assessment_admin or admin

A category can have one or more assigned users, and the same user can be assigned to more than one category.

The system also creates a link to the quiz in the recipients’ My Assessments & Surveys portal. Users can only answer questions in the categories that they are assigned to.

To select the recipients for each quiz category, click Availability and then fill in the fields as described in the table.

### Table 1085: Select recipients

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select category</td>
<td>Category for which the selected users are recipients.</td>
</tr>
</tbody>
</table>
Add users

Users selected as recipients for this category. The choice list shows all users in the system.

Publish a quiz
When you publish a quiz, the system sends email notifications to the recipients and to their managers. A card in each recipient's My Assessments & Surveys portal displays a link to the quiz.

Role required: assessment_admin or admin
1. If you want to see the quiz as the recipients will see it, point to the menu icon in the upper right of the quiz designer and click Preview.
2. When you are satisfied with the quiz, click Save and Publish or Publish to distribute it.

Copy a quiz
Create a copy of a quiz with at least one category. All associated questions (type), configurations, categories, metrics, domain separation rules, and role-based categories are copied. Assigned users, category users, instances, and trigger conditions are not copied.

Role required: assessment_admin or admin
1. Navigate to Quizzes Quizzes.
2. Select a quiz.
3. Perform any of the following steps:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>From Platform</td>
<td>In the title bar, click Copy.</td>
</tr>
<tr>
<td>From Platform</td>
<td>In the title bar, select Copy from the context menu.</td>
</tr>
<tr>
<td>From quiz designer</td>
<td>1. In the title bar, click Quiz Designer.</td>
</tr>
<tr>
<td></td>
<td>2. In the Quiz Designer title bar, point to the menu icon on the header bar</td>
</tr>
<tr>
<td></td>
<td>and click Copy Quiz</td>
</tr>
</tbody>
</table>

Edit a quiz
You can update a quiz after the quiz has been distributed.

Role required: assessment_admin or admin
You can only edit a quiz that has the same application scope as that of your current session.
• Questions that you add are available only on quizzes that are distributed after the update.
• Before a quiz is submitted or during the retake period:
  • Changes to existing questions are immediately available to users. This includes changes to the answers, such as additional choices or changes to the data type.
  • Deleted questions are deleted from distributed quizzes in users' queues.

Open the quiz: Group the Service Details form with one of the following options:
<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quizzes Quiz Designer</strong></td>
<td>Point to the menu icon in the quiz header bar and select Load Quiz.</td>
</tr>
<tr>
<td><strong>Quizzes Quizzes</strong></td>
<td>Right-click a quiz in the list and select Quiz Designer.</td>
</tr>
<tr>
<td><strong>Quizzes Quizzes</strong></td>
<td>Open a quiz from the list and click Quiz Designer in the header of the Assessment Metric Type form.</td>
</tr>
</tbody>
</table>

Enable a quiz retake

You can configure a quiz to allow recipients to resubmit their answers as many times as they like, until the quiz's due date.

Role required: assessment_admin or admin

Results are not calculated until the quiz's configured duration has elapsed. The card in the user's queue remains visible until the quiz's due date and displays a button to allow retakes.

1. Navigate to Assessments Metric Definition Types.
2. Remove the Evaluation method = Assessment filter condition so you can see all the records in the list.
3. Open the quiz.
4. In the Assessment Metric Type form, select the Allow retake check box and save the record.

View a quiz result

You can view quiz results for each question and category, or view the quiz scorecard for a detailed breakdown.

Role required: assessment_admin or admin

Quiz results are stored in the Metric Result [asmt_metric_result] table and display recipients' answers to each question in a category.

Navigate to Quizzes Quiz Results.

View a quiz designer scorecard

The quiz scorecard opens in the Category Results view.
For detailed information about scorecards, see Quiz Scorecards.

1. Navigate to Quizzes Quizzes.
2. Open the quiz whose results you want to view.
   The scorecard for the selected quiz opens in the Category Results view.
4. Select a category to view from the choice list above the chart.
View a quiz category result

Category results are stored in the Assessment Category Result [asmt_category_result] table and display the overall ratings for each category based on the weighted value for each scored question.

1. To view category results, navigate to Quizzes Category Results.

2. The system calculates results from the weight configured for each category. Weights are set to a value of 10 by default but can be changed. To edit a category's weight:
   3. Navigate to Quizzes Categories, and select a category from the list.
   4. In the Metric Category form, edit the default value in the Weight field.
   5. Click Update.

   **Note:** You can also edit the weight of a question in the Quiz view of the Assessment Metric form.

Take a quiz

All available quizzes assigned to you appear in your personal assessment and survey queue. When you submit a quiz, the system stores your responses. If a quiz allows retakes, you can resubmit it as many times as you like until its due date.

Role required: none

No special role is required to complete a quiz, but you must be logged in and the quiz must be assigned to you.

If configured to send email, the system sends you a notification when a quiz is assigned to you. The message contains a link to the quiz and instructions for viewing the assessment and survey queue.

Each quiz assigned to you appears in your assessment and survey queue as a card that contains information about the quiz, including a launch button. Overdue quizzes are marked with a red icon and red due date.

You must answer every required question, indicated by a red star, before you can submit the quiz. If you start to take a quiz but cannot complete it, save your responses and return to it later. When you have answered all the questions and are satisfied with the responses, submit the quiz.

By default, you cannot modify your answers to a quiz after submission. However, if the administrator has configured this quiz to allow retakes, the quiz remains in your queue after you finish it and the card shows a Modify Quiz button. You can retake the quiz as many times as you like before the due date.

1. Navigate to Self-Service My Assessments & Surveys.
2. Click Take Quiz on a quiz card to open the questionnaire. If there is more than one quiz category, you can click the collapse or expand icon to hide or show the questions in the category.

3. Answer each question to the best of your ability. If you are unsure of how to respond to a question or if a question does not apply to you, select Not Applicable, if that choice is available.

4. Click Save at any time to save your responses without submitting them. You can reopen the quiz from your queue when you are ready to work on it again.

5. When you are ready to submit the completed quiz, read any assertions that require your attention.

6. If present, select the check box to acknowledge the assertion. If your full name is displayed, you are required to provide authentication to acknowledge the assertion after you submit the quiz.

7. Click Submit.

8. If prompted, enter your user name and password to verify your signature. If you provided valid answers for all mandatory questions, a success message appears, displaying any end note that was configured. If the quiz allows retakes, the card remains in your queue with a Modify Quiz button after submission. If retakes are not permitted, the card disappears from your queue.

9. If the system displays an error message indicating that a question has an invalid response or must still be answered, correct the error and resubmit the quiz.

10. To edit your answers and resubmit a quiz that permits retakes, click Modify Quiz. You can modify your responses to the quiz until its due date.

View a quiz instance

A quiz instance represents one questionnaire assigned to one user. View an instance to verify that quiz instances were created, to check the state of a quiz instance, or to reassign a quiz instance.

Role required: admin or assessment_admin

1. Navigate to Quizzes Quiz Instances.

   The following sub-modules are available based on the state of the instances:
   - Ready to take: Displays quiz instances that are ready to be taken by the user. By default, these instances are sorted in ascending order by the Number field.
   - In progress: Displays quiz instances that are in progress. By default, these instances are sorted in ascending order by the Number field.
   - Completed: Displays quiz instances that are complete. By default, these instances are sorted in descending order by the Taken on field.
   - Cancelled: Displays quiz instances that are canceled. By default, these instances are sorted in ascending order by the Number field.
   - All: Displays quiz instances in all states. By default, these instances are sorted in ascending order by the Number field.

2. Click a quiz instance from the required sub-module. By default, the following fields are displayed for all sub-modules other than Completed.

   Note: When you select an instance in the Completed sub-module, you are redirected to the User's Response page.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Automatically generated record number.</td>
</tr>
<tr>
<td>Metric type</td>
<td>Metric type of this quiz.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Due Date</td>
<td>Date by which the quiz instance should be completed. The system populates the due date based on the Assessment duration of the associated quiz definition, which is set to 14 days by default. The quiz due date is not enforced in the base system. If you want to enforce the due date, consider using a workflow or other mechanism to send survey recipients reminders when a survey is overdue.</td>
</tr>
<tr>
<td>State</td>
<td>State of the quiz.</td>
</tr>
<tr>
<td>Assigned to</td>
<td>User that the quiz instance is assigned to. This field becomes read-only when the state is In progress, Complete, or Canceled.</td>
</tr>
<tr>
<td>Domain</td>
<td>Domain associated with the instance.</td>
</tr>
<tr>
<td>Related Link</td>
<td></td>
</tr>
<tr>
<td>View User's Response</td>
<td>Shows a read-only version of the survey responses completed by the user.</td>
</tr>
<tr>
<td>Related List</td>
<td></td>
</tr>
</tbody>
</table>
| Assessment Instance Questions | All instance question records that store user response values for each question on the quiz questionnaire. The following columns are relevant to quiz:  
• Category: Displays the quiz categories the questions belong to.  
• Metric: Displays the quiz questions. |

**Quiz scorecards**

The Quizzes application prepares printable scorecards. A scorecard analyzes category and question responses and compares current ratings with previous ratings. You can examine ratings over time, compare question ratings, or compare the ratings of all categories. All ratings are averages for the time range selected.

The system dynamically updates a scorecard each time you view it, so the ratings reflect recently completed quizzes.
Category results

The Category Results view is a stacked bar chart of responses to all questions in a category. Select the category to display from the choice list above the chart. Category results are only calculated for scored questions.

This view displays responses that use the following data types:

- Checkbox
- Choice
- Likert Scale
- Number
- Template
- Yes/No

**Note:** The Checkbox and Yes/No data types are combined into the Boolean data type in the Quiz designer.
Figure 482: Quiz category results
To view details about a specific response to a question, point to the colored segment representing a specific response. The chart displays the count for those responses and the percentage it represents of the total responses to that question.

![Diagram showing response details](image)

Figure 483: Quiz category result details

**Question results**

The Question Results view shows the results for all questions in a quiz. Select a question by name from the choice list to display the results in a pie chart or a bar chart, based on the data type.

**Pie chart**

The pie chart shows question results for these *data types*:

- Checkbox
- Choice
- Likert Scale
- Number
- Template
- Yes/No

**Note:** The Checkbox and Yes/No data types are combined into the Boolean data type in the Quiz designer.
Figure 484: Quiz scorecard question results - pie chart
Bar chart

A bar chart appears when question results use this data type:

- Percentage

By default, all results for percentage questions use a report range of 20% segments. To configure a report range, navigate to Reports Administration Report Ranges.

Average ratings

The Average Ratings view displays a bar chart of the weighted average rating for each question in a category.

Use this view to learn how individual questions affect the overall rating for the category. Select a category from the second choice list above the chart. Ratings are only calculated for scored questions.
Figure 485: Average Ratings view

To view the effect of each question's ratings on the entire category's ratings, point to the colored bar. The pop-up box shows the percentage of the total ratings represented by each individual question's weighted average.
Quiz reports

Quizzes provide several global reports so that assessment administrators can view important statistics. You can share these reports with specific users or groups and change the display options.

For detailed field information and reporting options, click the link for the chart Type. To sort a column in ascending or descending order, click the arrow in the column heading.

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes by State</td>
<td>State of distributed quizzes. This chart displays the percentage of distributed quizzes that are ready to take, in progress, complete, or canceled.</td>
</tr>
<tr>
<td></td>
<td>• Type: Pie Chart</td>
</tr>
<tr>
<td></td>
<td>• Table: Assessment Instance [asmt_assessment_instance]</td>
</tr>
<tr>
<td>Total Questions by Quiz</td>
<td>Total number of questions for all categories in each quiz.</td>
</tr>
<tr>
<td></td>
<td>• Type: Bar Chart</td>
</tr>
<tr>
<td></td>
<td>• Table: Assessment Metric [asmt_metric]</td>
</tr>
<tr>
<td>Questions by Data Type</td>
<td>Total number of questions in all quizzes by data type.</td>
</tr>
<tr>
<td></td>
<td>• Type: Bar Chart</td>
</tr>
<tr>
<td></td>
<td>• Table: Assessment Metric [asmt_metric]</td>
</tr>
<tr>
<td>Correct Answers by Assigned User</td>
<td>Total number of scored questions answered correctly by each assigned user.</td>
</tr>
<tr>
<td></td>
<td>• Type: Bar Chart</td>
</tr>
<tr>
<td></td>
<td>• Table: Metric Results [asmt_metric_result]</td>
</tr>
<tr>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Number of Correct Answers</td>
<td>Total number of correct answers for each scored question.</td>
</tr>
<tr>
<td></td>
<td>• Type: Bar Chart</td>
</tr>
<tr>
<td></td>
<td>• Table: Metric Results [asmt_metric_result]</td>
</tr>
<tr>
<td>Incorrect Answers by Assigned User</td>
<td>Total number of scored questions answered incorrectly by each assigned user.</td>
</tr>
<tr>
<td></td>
<td>• Type: Bar Chart</td>
</tr>
<tr>
<td></td>
<td>• Table: Metric Results [asmt_metric_result]</td>
</tr>
<tr>
<td>Number of Incorrect Answers</td>
<td>Total number of incorrect answers for each scored question.</td>
</tr>
<tr>
<td></td>
<td>• Type: Bar Chart</td>
</tr>
<tr>
<td></td>
<td>• Table: Metric Results [asmt_metric_result]</td>
</tr>
</tbody>
</table>

**Wizards**

Administrators can create wizards to provide a step-by-step sequence of dialog boxes that lead the user through a procedure.

Administrators can create wizards to provide a step-by-step sequence of dialog boxes that lead the user through a procedure. For example, a wizard may lead users through reporting an incident (creating an incident record) without opening a list or form.

![Figure 487: Record generator wizard](image)
Create a basic wizard

This example creates a basic wizard that reports an incident.

1. Activate the system wizards application, if necessary.
2. Navigate to System Wizards Wizards.

3. Click New.
4. Enter the wizard Name of Report Incident.
5. Right-click the header and select Save.

Define a wizard variable

How to define a wizard variable.

**Note:** To learn more, see *Define a variable.*

Define wizard variables:
Figure 488: Basic variables

1. In the Wizard Variable related list, click New.
2. Enter the variable details.
   - Type: Multiple Choice
   - Name: incident
   - Question: What are you having difficulties with?
3. Right-click the header and select Save.
4. In the Question Choices related list, click New.
5. Enter Email Issue in the Text and Value fields, and click Submit.
6. Repeat steps 4 – 5 for the following question choices:
   - Computer Issue
   - Password Reset
7. In the Wizard Variable related list, click New.
8. Enter the variable details and click Submit.
   - Type: Wide Single Line Text
   - Name: description
   - Question: Please describe your symptoms

Create the first panel

Create the first panel of the example wizard.

Note: To learn more, see Wizard Panels.

1. In the Wizard Panels related list, click New.
2. Select a Type of A panel that prompts the user to answer questions.
3. Enter the panel details.
   - Name: Service Questions
   - Title: Service Desk Wizard
4. Right-click the header and select Save.
5. In the Variables related list, click Edit....
6. Using the *slushbucket*, select and arrange the variables as listed:
   1. What are you having difficulties with?
   2. Please describe your symptoms
7. Click Update.

Create the second panel option

How to create the second panel option.
1. In the Wizard Panels related list, click New.
2. Select a Type of a panel that creates something (like a change request or an incident).
3. Enter the panel details and click Submit.
   - Name: Email Incident
   - Table: Incident [incident]
   - Final View: ess
4. Right-click the header and select Save.
5. In the Field Setters related list, click New.
6. Enter the field setter details and click Submit.
   - Type: Set field to a variable
   - Field: Short description
   - Variable: description
7. In the Field Setters related list, click New.
8. Enter the field setter details and click Submit.
   - Type: Set field to a specific value
   - Field: Category
   - Value: software
9. Repeat steps 1 – 8 to create additional panels with the values listed in the table.

### Table 1088: Second panel options table

<table>
<thead>
<tr>
<th>Step 3. Panel Name</th>
<th>Step 8. Category Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Incident</td>
<td>hardware</td>
</tr>
<tr>
<td>Password Incident</td>
<td>network</td>
</tr>
</tbody>
</table>
Test the wizard

Run through several scenarios to test transition logic and record generation.

1. Navigate to System Wizards Wizards.
2. Click Report Incident.
3. Click Test.
4. Enter the following information and click Next.
   a. What are you having difficulties with?: Email Issue
   b. Please describe your symptoms: Can't access email
5. Verify that a new record is created and the values match step 4.
6. Repeat steps 1 – 5 to test each multiple choice answer.

Wizard transitions

Transitions define logic used to move between panels in wizards.

Transition logic may be based on a predefined order (basic panel flow) or user input (defined transitions).

Note: The System Wizards application is not active by default.

Use basic panel flow in a wizard

Basic panel flow moves through wizard panels in order, without the need to define logic for each transition. A wizard may use either basic panel flow or defined transitions, but not both.

1. Open the wizard.
2. Select the Basic panel flow check box. If necessary, configure the wizard form to add the field.
3. Enter the First panel in the reference field.
4. For each panel, define an Order. If necessary, configure the panel form to add the field.
Define a panel transition

Specify the conditions to move from one wizard panel to another.

1. Open the panel.
2. In the Transitions related list, click New or select the transition to edit.
3. Using the condition builder, define a transition condition based on wizard variables. Leave the condition empty to use the transition in all cases.
4. In the To field, select the next panel.
5. In the From field, select the previous panel.
6. Define a Transition script that runs when the transition is used.
Wizard variables

Wizard variables are questions that collect and store user input. Define variables for a wizard and then add them to wizard panels.

Use data collected by wizard variables to:

- Define transition conditions.
- Set field values in record generators.
- Define dynamic functionality with UI policy and client scripts.
- Implement advanced functionality with wizard scripts.

**Note:** The System Wizards application is not active by default.

Add a variable to a panel

Collect user input by adding variables to a panel.

Add variables to a panel that prompts user to answer questions (wizard panel) or a survey panel (requires Survey Wizard plugin):

1. Navigate to System Wizards Wizards.
2. Open the wizard.
3. In the Wizard Panels related list, open the panel to which you are adding a variable.
4. In the Variables related list, click Edit.
5. Using the slushbucket, add and arrange the order in which variables appear on the panel. Only variables defined on the wizard are available on a panel.
Define a question choice

Some variable types require choices. For example, a multiple choice question—such as What kind of e-mail account do you want?—requires options—such as Exchange and UNIX.

1. Open the variable definition.
2. In the Question Choices related list, click New.
3. Enter the question choice details and save the record.
   - Text - option the user sees
   - Value - value stored in the variable
4. Repeat steps 2 – 3 for all available options.

Define a wizard variable

Collect and store user input in a wizard variable.

1. Navigate to System Wizards Wizards .
2. Open the wizard to which you are adding a variable.
3. In the Wizard Variable related list, click New.
4. Select the variable Type.
   Wizards use the same variable types as service catalog items.
5. Enter the name used by the system, for example: resolved_to_satisfaction.
6. Enter an order number and select the name of the associated Wizard in the Expert field.
7. Enter a descriptive question in the Question field.
8. Enter the remaining variable details if necessary and save the record.

Publish the basic wizard
Create a wizard launcher to make the wizard available through the service catalog homepage.

**Note:** To learn more, see *Publish a Wizard.*
1. Navigate to Service Catalog Wizards.
   
   If you do not see Wizards under Service Catalog, complete the next step.
2. To add the Wizards module to the Service Catalog, perform the appropriate action for your version of the UI:

   | UI16 | 1. Navigate to System Definition Application Menus.
   |      | 2. Select Service Catalog.
   | UI15 | Right-click the Service Catalog application menu and select Edit Application Menu.

3. Click New.
4. Enter the wizard launcher details and save the record.
   - Name - Report an Incident
   - Category: Can We Help You?
   - Wizard: Report Incident
   - Active: select the check box

Link to a Wizard

Provide access to wizards via links, such as defining a new module or sending a link via email (public wizards only).

<table>
<thead>
<tr>
<th>Desired Action</th>
<th>URL schema</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start a new wizard or resume an in progress wizard if the user is logged in</td>
<td>https://&lt;base URL&gt;/nav_to.do?uri=expert_shell.do?sysparm_sys_id=&lt;wizard_sys_id&gt;</td>
</tr>
<tr>
<td>Require the user to restart a wizard from the beginning regardless of previous progress</td>
<td>https://&lt;base URL&gt;/nav_to.do?uri=expert_shell.do?sysparm_sys_id=&lt;wizard_sys_id&gt;%26sysparm_initial=true</td>
</tr>
</tbody>
</table>

Example - Define a Wizard Module in Self-Service:

1. Navigate to System Wizards Wizards.
2. Open the wizard.
3. In the Roles field, add the user roles that have access to the wizard.
4. Right-click the header and copy the sys_id for the wizard.
5. Click Update.
6. In the navigation pane, right-click Self-Service and select Edit Application.
7. In the Modules related list, click New.
8. Enter the following information and save the record.
   • Title and Order
   • Link type: URL (from arguments)
   • Arguments: /expert_shell.do?sysparm_sys_id=<wizard sys_id from step 2>

Create a public page

A public page is accessible to all users without having to log in or have a particular user role.

Create a public page:
1. Navigate to System Definition Public Pages. (You may need to enable the module, as it is not active by default.)
2. Click New.
3. Enter the name of the UI page specified (for example, test_page)

Make a wizard public

Public wizards are available for use without logging in.

Reasons to make a wizard public include:
• Allowing non-users to report an incident
• Collecting anonymous survey responses (requires Survey Wizard Plugin)

Once a wizard is made public, deliver it using a link via email or a module on the welcome page (available before a user has logged in).

Make a role public

Enable the public role to read and write wizard variables.

Add public to all relevant roles for the wizard:
1. Add public to the Roles field.
2. For each wizard variable defined for that wizard, add public to the read roles and write roles fields. (You may need to personalize the form to add the read roles and write roles).
3. Similarly, add public to the read roles and write roles fields for each variable associated with each wizard panel for that wizard.

Modify a script

Modify record generator panels to allow users with no role to create records using the wizard.

Modify the script for all record generators (wizard panels) within the wizard.
1. Navigate to System Wizards Wizards.
2. Open the relevant wizard.
3. In the Wizard Panels related list, open the record generator panel(s).
4. Enter the following script in the Script field for each record generator (Personalize the form to add the Script field, if necessary):
# Process description

Enable and Select the Wizard

Select the wizard to be made public:

1. **Activate** the Wizards application in the application navigator.
2. Navigate to **System Wizards Wizards**
3. Select and open the wizard to be made public.

# Publish a wizard

Specify how users access a wizard and what roles are necessary to access it.

Administrators grant users access to published wizards by two means.

- Using links
- As an item in the service catalog

Administrators can also restrict user access to wizards by role and make wizards available to the public (users that are not logged in).

---

**Note:** The System Wizards application is not active by default. To use wizards, see **Activate a System Wizard**.

---

To define the user roles that have access to a wizard:

1. Navigate to **System Wizards Wizards**.
2. Open the wizard.
3. In the Roles field, define the user roles that have access to the wizard. Leave the field blank to allow access for all users.

---

**Send a public wizard link via email**

After a wizard is configured as public, it can be delivered via email to anyone, including recipients who are not ServiceNow users.
To send a link to the public wizard via email:

1. Navigate to System Wizards Wizards .
2. Open the wizard.
3. Right-click the header and copy the sys_id for the wizard.
4. Create an email with an email link, using the URL schema:
   
   https://<base URL>/nav_to.do?uri=expert_shell.do?sysparm_sys_id=<wizard sys_id from step 3>

Test the page
Verify the wizard is functional for a public user.
Log out, then click the module (in this example, the Test module under the Self-Service application).

Add a wizard to the service catalog

Make a wizard available through the service catalog homepage.

1. Navigate to Service Catalog Wizards .
2. Click New.
3. Enter the wizard launcher details and save the record.
   - Name - name by which the wizard appears in the service catalog
   - Category - category under which the wizard appears
   - Wizard - reference to the wizard
   - Active - select the check box
   - Short Description and Description (optional)
Create a public module within the parent application, pointing to the wizard,

1. Copy the `sys_id` for the wizard: right-click the wizard header, and copy the wizard's `sys_id`.
2. In the application navigator, right-click the parent application name (for example, Self-Service) and select Edit Application Menu.
3. Add public to the Roles field.
4. In the Modules section, select New to create a new module, with the following fields, then select Submit to save the record.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>Module title (for example, Test)</td>
</tr>
<tr>
<td>Link type</td>
<td>URL (from Arguments)</td>
</tr>
<tr>
<td>Roles</td>
<td>public</td>
</tr>
<tr>
<td>Arguments</td>
<td><code>expert_shell.do?sysparm_sys_id=&lt;sys_id of the Wizard&gt;</code></td>
</tr>
</tbody>
</table>

**Survey wizards**

The Survey Wizard plugin creates surveys using wizards.
Advantages versus other survey functionality include the ability to:

- Ask different questions based on responses (dynamic surveys)
- Create multiple page surveys
- Record answers for partially completed surveys

This plugin integrates with the Best Practice - Task Survey Management plugin. Because the plugin relates to the Legacy Surveys application, the plugin is documented on the ServiceNow wiki.

**Configure the survey property**

How to configure the survey properties (apply to all survey wizards and surveys).

1. Navigate to Survey Wizards Survey Properties.
2. Ensure the Enable the enhanced task survey capabilities. Survey distribution is controlled by Survey Conditions. property is enabled (select the check box).

**Create a page**

How to create the survey pages (wizard panels) and add questions.

1. Navigate to Survey Wizards All and open the survey wizard.
2. In the Survey Panels related list, click New.
3. Enter the Name, Title, and Description.
4. Right-click the header and select Save.
5. In the Variables related list, click Edit....
6. Using the `slushbucket`, select and arrange survey questions on the panel.
7. Repeat steps 1 – 6 for each page of the survey wizard.
Create a dynamic effect optional
Create dynamic effects, such as hiding or showing fields on a panel based on answers.

1. Navigate to Survey Wizards Wizard Policy Wizard UI Policy or Survey Wizards Wizard Policy Wizard Client Scripts
2. Click New.
3. Enter the UI policy or client script details.

**Note:** For more information, see *wizard scripts*.

Define a transition
Transitions define the logic used to move between pages (wizard panels) in a survey.
Use panels and transition logic to implement multiple page surveys and dynamic effects, such as skipping pages based on answers.

Define transitions:
1. Navigate to Survey Wizards All and open the survey wizard.
2. Open a survey panel.
3. In the Wizard Panel Transitions related list, click New.
4. Enter the transition details and click Submit.
5. Repeat steps 1 – 4 for all transitions between pages in the survey wizard.

**Note:** To learn more, see *Wizard Transitions*.

Create a survey condition
How to create a survey condition that controls when and to whom the survey wizard is sent.

Create a *survey condition* that controls when and to whom the survey wizard is sent:

1. Navigate to Survey Wizards Survey Conditions.
2. Click New.
3. Select a Type of Survey Wizard. Only a survey or survey wizard is sent (determined by Type), even if both are defined for the condition.
4. Enter the condition details.
5. Click Submit.

Create the email notification
Create an email notification to deliver the survey wizard.

Role required: admin or survey_admin

1. Navigate to System Policy Email Notifications.
2. Filter the list to view notifications with an Event Name of task.send_survey, which is the event that is triggered when survey conditions are met.
3. Open a survey notification in the filtered list or click New.
4. Enter the email notification details. If you are creating a new notification, be sure to adjust conditions and weight to avoid conflicts with existing survey notifications (Event Name of task.send_survey).
5. Click Update or Submit.

Create the survey wizard

How to create the survey wizard.

The following steps provide an overview of building a survey wizard.

1. **Activate the Survey Wizard plugin**, if necessary.
2. Navigate to Survey Wizards All.
3. Click New.
4. Enter the survey wizard Name.
5. In the Roles field, add the public role.
6. Right-click the header and select Save.

Define a question

How to define survey questions (wizard variables).

1. In the Wizard Variable related list, click New.
2. Enter the variable details.
3. In the Read roles field, add the public role.
   Configure the form to add the Read roles field, if necessary.
4. Click Submit.
5. Repeat steps 1 – 4 for all questions in the survey.

**Note:** To learn more, see [Define a Wizard Variable](#).

Installed components

Fields, tables, a business rule, a script include, an application, a survey wizard panel, and demo data (optional).

The following tables are modified:

<table>
<thead>
<tr>
<th>Display Name (Table Name)</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey Conditions (survey_conditions)</td>
<td>Add fields to determine which survey is sent when conditions are met:</td>
</tr>
<tr>
<td></td>
<td>• Type - either a survey or survey wizard</td>
</tr>
<tr>
<td></td>
<td>• Survey_wizard - reference to applicable survey wizard</td>
</tr>
</tbody>
</table>
The following tables are added:

<table>
<thead>
<tr>
<th>Display Name (Table Name)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey Panel (expert_panel_survey)</td>
<td>Adds a survey panel to wizards. Extends the expert_panel table</td>
</tr>
<tr>
<td>Survey Wizard (expert_survey)</td>
<td>Stores survey wizards. Extends expert</td>
</tr>
</tbody>
</table>

The SurveyUtils script include is added to record responses during survey panel transitions.

The Task Survey Events business rule is modified to include logic for sending survey wizards. Customers who have modified this business rule can not install the updated version automatically.

For information about the link generated from the business rule script, see Survey Wizard - Multiple Instances on the ServiceNow Community.

The plugin adds Survey as a new type of wizard panel. Survey wizards are created using survey panels. Survey wizard responses are saved when the user navigates between survey panels (clicks Next or Previous), as opposed to saving responses only at the end (surveys). This feature allows a logged in user to resume a survey that is in progress and allows survey readers to collect response data for partially completed surveys. To support the ability to resume surveys in progress, survey wizard answers are also temporarily stored in XML in the expert_instance table. When the user clicks Done on the last panel of the survey wizard, the record in the expert_instance table is deleted.

For information about having more than one instance of a given Wizard in play at a time, see Survey Wizard - Multiple Instances on the ServiceNow Community.

Demo data is available with this plugin. If you choose to install demo data, a sample survey wizard, called Customer Satisfaction Survey, is added to the database.

Request survey wizard

Before activating this plugin, consider the installed components, dependencies, and impact.

- Installed Components - fields, tables, a business rule, a script include, an application, a survey wizard panel, and demo data (optional). For more details, see Installed Components.
- Dependencies - Best Practice - Task Survey Management (inactive by default)
- Impact - adds fields to existing tables, installs the Best Practice - Task Survey Management plugin, and modifies the Task Survey Events business rule. You may choose to install a demo survey with the plugin. The plugin integrates with standard survey functionality, so there is no need to transition
existing surveys to survey wizards. However, survey administrators must specify a type (survey or survey wizard) for new survey conditions.

1. In the HI Service Portal, click Service Requests Activate Plugin.
2. Fill out the form.

<table>
<thead>
<tr>
<th>Target Instance</th>
<th>Instance on which to activate the plugin.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plugin Name</td>
<td>Name of the plugin to activate.</td>
</tr>
<tr>
<td>Specify the date and time you would like this plugin to be enabled</td>
<td>Date and time must be at least 2 business days from the current time.</td>
</tr>
</tbody>
</table>

**Note:** Plugins are activated in two batches each business day in the Pacific time zone, once in the morning and once in the evening. If the plugin must be activated at a specific time, enter the request in the Reason/Comments.

| Reason/Comments | Provide any information that would be helpful for the ServiceNow personnel activating the plugin. For example, if you need the plugin activated at a specific time instead of during one of the default activation windows. |

3. Click Submit.

**Test the survey wizard**

How to test the survey wizard.

1. Navigate to Survey Wizards All and open the survey wizard.
2. Click Try it.
3. Answer survey questions and verify the transition logic based on answers, if applicable.
4. At survey completion, click Done.
5. Navigate to Survey Wizards Survey Instances.
6. Search for and open the most recent instance of the survey wizard.
7. Verify that your survey answers are properly recorded.
8. Run through several scenarios to test transition logic and data collection.

**Create a survey wizard (demo)**

This example creates a survey using a survey wizard.

This example creates a survey using a survey wizard (requires the Survey Wizard plugin). The survey uses dynamic features that are available using wizards.

*Create the survey wizard demo*

Create the survey wizard.

1. **Activate the Survey Wizard plugin**, if necessary.
2. Navigate to Survey Wizards All.
3. Click New.
4. In the Name field, enter Software Needs Analysis.
5. In the Roles field, add the public role.
6. Right-click the header and select Save.

![Survey Wizard](image)

**Define a survey question**
How to define survey questions (wizard variables).

1. In the Wizard Variable related list, click New.
2. Enter the variable details as listed in the table.
3. In the Read roles field, add the public role.
   Configure the form to add the Read roles field, if necessary.
4. Click Submit.
5. Repeat steps 1 – 4 for all variables in the table.

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Question</th>
<th>Additional configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>CheckBox</td>
<td>office</td>
<td>Microsoft Office Suite</td>
<td></td>
</tr>
<tr>
<td>CheckBox</td>
<td>creativesuite</td>
<td>Adobe Creative Suite</td>
<td></td>
</tr>
<tr>
<td>CheckBox</td>
<td>other</td>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>Label</td>
<td>needs</td>
<td>Business software you use (select all that apply):</td>
<td></td>
</tr>
<tr>
<td>Single Line Text</td>
<td>otherprod</td>
<td>Please specify:</td>
<td></td>
</tr>
<tr>
<td>Numeric Scale</td>
<td>powerpoint</td>
<td>PowerPoint</td>
<td>Scale min: 1</td>
</tr>
<tr>
<td>Numeric Scale</td>
<td>word</td>
<td>Word</td>
<td>Scale min: 1</td>
</tr>
<tr>
<td>Numeric Scale</td>
<td>excel</td>
<td>Excel</td>
<td>Scale min: 1</td>
</tr>
<tr>
<td>Numeric Scale</td>
<td>publisher</td>
<td>Publisher</td>
<td>Scale min: 1</td>
</tr>
<tr>
<td>Numeric Scale</td>
<td>access</td>
<td>Access</td>
<td>Scale min: 1</td>
</tr>
<tr>
<td>Yes/No</td>
<td>photoshop</td>
<td>Photoshop</td>
<td>Default value: No</td>
</tr>
<tr>
<td>Yes/No</td>
<td>illustrator</td>
<td>Illustrator</td>
<td>Default value: No</td>
</tr>
</tbody>
</table>
Create a survey page
Create the survey pages (wizard panels) and add questions.

1. Navigate to Survey Wizards All and select Software Needs Analysis.
2. In the Survey Panels related list, click New.
3. Enter the Name, Title, and Description as listed in the table.
4. Right-click the header and select Save.
5. In the Variables related list, click Edit....
6. Using the slushbucket, select and arrange the variables as listed in the table.
7. Repeat steps 1 – 6 for all panels in the table.

Table 1093: Panel variables table

<table>
<thead>
<tr>
<th>Name and Title</th>
<th>Description</th>
<th>Add variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describe Needs</td>
<td>Please complete this survey to help us evaluate our ongoing software needs.</td>
<td>Business software you use (select all that apply):</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Microsoft Office Suite</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adobe Creative Suite</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Please specify:</td>
</tr>
<tr>
<td>Microsoft Office</td>
<td>Please rate the importance of each program to your job, using a scale from 1 to 5 (1 = not important, 5 = very important):</td>
<td>Word</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PowerPoint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Excel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Publisher</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Access</td>
</tr>
<tr>
<td>Adobe Creative Suite</td>
<td>Have you used these programs?</td>
<td>Acrobat</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Illustrator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Photoshop</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dreamweaver</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Describe projects for which you use these tools:</td>
</tr>
</tbody>
</table>
Create a dynamic effect
How to create a dynamic effect.
On the Describe Needs panel, if the user selects Other, then the Please specify field should be visible and mandatory.

Figure 490: Survey wizard UI

1. Navigate to Survey Wizards Wizard Policy Wizard UI Policy.
2. Click New.
3. Enter the UI policy details.

Table 1094: UI policy details

<table>
<thead>
<tr>
<th>Name</th>
<th>Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wizard</td>
<td>Software Needs Analysis</td>
</tr>
<tr>
<td>Reverse if false</td>
<td>select the check box</td>
</tr>
<tr>
<td>On load</td>
<td>select the check box</td>
</tr>
<tr>
<td>Active</td>
<td>select the check box</td>
</tr>
<tr>
<td>Short description</td>
<td>If Other is true, show Specify</td>
</tr>
<tr>
<td>Wizard Conditions</td>
<td>other is true</td>
</tr>
</tbody>
</table>

4. Right-click the header and select Save.
5. In the Wizard UI Policy Actions related list, click New.
6. Enter the action details and click Update.
   - Variable Name: otherprod
   - Mandatory: True
   - Visible: True

**Define a transition demo**
How to define transitions.

1. Navigate to Survey Wizards All and select Software Needs Analysis.
2. Open a survey panel as listed in the table.
3. In the Wizard Panel Transitions related list, click New.
4. Enter the transition details and click Submit.
5. Repeat steps 1 – 4 for all panel transitions in the table.

Table 1095: Panel transition details table

<table>
<thead>
<tr>
<th>Panel</th>
<th>Condition</th>
<th>Order</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describe Needs</td>
<td>office is true</td>
<td>100</td>
<td>Microsoft Office</td>
</tr>
<tr>
<td>Describe Needs</td>
<td>creativesuite is true</td>
<td>200</td>
<td>Adobe Creative Suite</td>
</tr>
<tr>
<td>Describe Needs</td>
<td></td>
<td>300</td>
<td>End Note</td>
</tr>
<tr>
<td>Microsoft Office</td>
<td>creativesuite is true</td>
<td>100</td>
<td>Adobe Creative Suite</td>
</tr>
<tr>
<td>Microsoft Office</td>
<td></td>
<td>200</td>
<td>End Note</td>
</tr>
<tr>
<td>Adobe Creative Suite</td>
<td></td>
<td>100</td>
<td>End Note</td>
</tr>
</tbody>
</table>

**Test the survey wizard demo**
How to test the survey wizard.

1. Navigate to Survey Wizards All and select Software Needs Analysis.
2. Click Try It.
3. In the Business software you use (select all that apply) question, select: Microsoft Office, Other.
4. Verify that the Please specify field appears and is mandatory when Other is selected (UI policy created in Dynamic Effects).
5. Click Next.
6. Verify that the Office panel appears.
7. Enter test values for the questions and click Next.
8. Verify that the End Note panel appears (the transition logic skips the Adobe Creative Suite panel when the Adobe Creative Suite check box is not selected on the first panel).
9. Click Done.
11. Search for and open the most recent instance of the Software Needs Analysis survey wizard.
12. Verify that your survey answers are properly recorded.
13. Run through several scenarios to test transition logic and data collection.
Configure the survey
How to configure the survey.

1. Navigate to Survey Wizards Survey Properties.
2. Ensure the Enable the enhanced task survey capabilities. Survey distribution is controlled by Survey Conditions. property is enabled (select the check box).
4. Click New.
5. Enter the condition details and click Submit.

<table>
<thead>
<tr>
<th>Name</th>
<th>Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Survey Wizard</td>
</tr>
<tr>
<td>Survey wizard</td>
<td>Software Needs Analysis</td>
</tr>
<tr>
<td>Active</td>
<td>select the check box</td>
</tr>
<tr>
<td>Table</td>
<td>Incident</td>
</tr>
<tr>
<td>User field</td>
<td>Caller</td>
</tr>
<tr>
<td>Description</td>
<td>Send software survey to all users with software questions</td>
</tr>
<tr>
<td>Condition</td>
<td>Category is Software</td>
</tr>
</tbody>
</table>

6. Navigate to System Policy Email Notifications.
7. Click New.
8. Enter the email notification details and click Submit.

<table>
<thead>
<tr>
<th>Name</th>
<th>Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Software Survey</td>
</tr>
<tr>
<td>Event Name</td>
<td>task.send_survey</td>
</tr>
<tr>
<td>Table</td>
<td>Incident</td>
</tr>
<tr>
<td>User field</td>
<td>event.parm1</td>
</tr>
<tr>
<td>Active</td>
<td>select the check box</td>
</tr>
<tr>
<td>Conditions</td>
<td>Category is Software</td>
</tr>
<tr>
<td>Subject</td>
<td>Please take the software survey (Incident ${number})</td>
</tr>
<tr>
<td>Message</td>
<td>Please complete this survey to help us evaluate our ongoing software needs. &lt;a href=${event.parm2}&gt;Click here to take the survey.&lt;/a&gt;</td>
</tr>
</tbody>
</table>

9. Filter the Email Notifications list using the condition: Event Name is task.send_survey and Table is Incident.
10. If any other notifications exist, increase their Weight value so that only the Software Survey is sent when the incident category is software (the Software Survey has a Weight of 0, so it has the highest priority of any notifications for the incident table).

Wizard panels

Wizard panels are screens that appear in a defined order. Each step in a wizard is represented by a panel. A wizard panel prompts users to answer questions. Wizard panel type-specific information is:

- Title - label that appears above the panel in wizard view.
- Description - text that appears above questions in wizard view.
- Variables - questions that collect user input. To learn more, see Wizard Variables.

Note: The System Wizards application is not active by default.

Catalog order and checkout panels

What catalog order and checkout panels display.

A catalog order panel displays listings for service catalog items in tabbed view. A catalog checkout panel displays an order confirmation screen for the items on the preceding catalog order panel. Use these panels to create an order guide using wizards.
KB viewers

What a KB viewer panel displays.

A KB Viewer panel displays a knowledge base article. KB Viewer type-specific information is:
- KB Article - reference to the desired knowledge base article
- Title - label that appears above the article in wizard view

Record generators

A record generator panel creates a record in a table, such as an incident or change request.

There is no transition after the Record Generator. The following table includes fields specific to the Record Generator.

Table 1098: Generator type-specific information

<table>
<thead>
<tr>
<th>Title</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table</td>
<td>table in which to create a record (select Global when using a script)</td>
</tr>
<tr>
<td>Template</td>
<td>(optional) define field values on the new record using a template</td>
</tr>
<tr>
<td>Final view</td>
<td>(optional) enter the view in which to show the submitted form (such as ESS)</td>
</tr>
<tr>
<td>Script</td>
<td>script that runs when the panel is used. To learn more, see wizard scripts.</td>
</tr>
<tr>
<td>Field setters</td>
<td>define field values in the target table.</td>
</tr>
</tbody>
</table>

Field setters

A field setter defines a field value for a record created by a record generator.

Table 1099: Field setters

<table>
<thead>
<tr>
<th>Field</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Template</td>
<td>Name of the record generator panel.</td>
</tr>
<tr>
<td>Type</td>
<td>To define a static value (the same for each record created by the record generator), select Set field to a specific value. To define a value based on a wizard variable, select Set field to a variable.</td>
</tr>
<tr>
<td>Field</td>
<td>Select the field name.</td>
</tr>
<tr>
<td>Value</td>
<td>Enter the value (static) or select the wizard variable name.</td>
</tr>
</tbody>
</table>
Redirect panel

A Redirect panel specifies a URL to which the user is taken upon transition to the panel.

Redirect type-specific information is:

• URL - URL location to which user should be taken
• Advanced - select this option to use a script
• Script - script that runs when the panel is used. To learn more, see wizard scripts.

Change a banner setting

How to change a banner setting.

Steps displayed in the banner can be manually defined or automatically generated.

To change the banner settings:

1. Navigate to System Wizards Wizards.
2. Create or open a wizard.
3. Set the Banner type field:
   • Select Fixed number of (user defined) steps for manually defined steps.
   • Select Generated based on panel history for automatically generated steps. Automatically generated steps do not display initially but are added as the user reaches each step. Automatic banner text is generated using the Title field of each wizard panel.
   • Select None to disable the wizard banner.

Create a fixed wizard banner step

How to create fixed wizard banner steps.

Steps displayed in this banner can be manually defined or automatically generated.

1. Select Fixed number of (user defined) steps from the Banner type dropdown.
2. Select the Banner steps related list and click New.
3. Assign a name to your banner step. This name is what appears on the wizard.
4. Assign a display order (such as 100, 200, 300).
5. Repeat steps 2 – 4 for each banner step in the wizard.
6. On the wizard record, click the Wizard Panels related list.
7. In the Banner step field, enter the banner step that is completed when the wizard panel is displayed. Completed steps display in green in the wizard banner.

Note: You may need to configure the list to add the Banner step field.
Create a panel

How a user creates a panel.

1. Navigate to System Wizards Wizards.
2. Open the wizard to which you are adding a panel.
3. In the Wizard Panels related list, click New.
4. Select the type of panel to create.
5. Enter basic panel information.

Table 1100: Basic panel information

<table>
<thead>
<tr>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Brief description of the panel</td>
</tr>
<tr>
<td>Expert</td>
<td>Name of the wizard</td>
</tr>
<tr>
<td>Title</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Next message</td>
<td>Label on the button that transitions to the next panel. This option does not apply for the last panel</td>
</tr>
<tr>
<td>Previous message</td>
<td>Label on the button that transitions to the previous panel. This option does not apply for the first panel</td>
</tr>
</tbody>
</table>

6. Enter type-specific information and save the record.
   - Prompts user to answer questions (wizard panel)
   - Survey (requires Survey Wizard Plugin)

Edit a panel

An Edit Panel button is available on wizard panels when testing the wizard. The button is available if the user can write to the expert record.

To control who can access this button, edit the write ACL on the Wizard [expert] table.

1. Navigate to System Wizards Wizards.
2. Open the wizard containing the panel you want to edit.
3. Click Try It.
4. Click Edit Panel.

Use wizard banners

The wizard banner is a graphical flow of wizard steps displayed at the top of a wizard.
Activate a system wizard
The System Wizards application is not active by default.
To activate system wizards:
1. Navigate to System Definition Application Menus.
2. In the breadcrumbs, click All to display both active and inactive applications.
4. Ensure the Active field is set to true.

Define a wizard variable
How to define a wizard variable.

Note: To learn more, see Define a variable.

Define wizard variables:
Figure 492: Basic variables

1. In the Wizard Variable related list, click New.
2. Enter the variable details.
   - Type: Multiple Choice
   - Name: incident
   - Question: What are you having difficulties with?
3. Right-click the header and select Save.
4. In the Question Choices related list, click New.
5. Enter Email Issue in the Text and Value fields, and click Submit.
6. Repeat steps 4 – 5 for the following question choices:
   - Computer Issue
   - Password Reset
7. In the Wizard Variable related list, click New.
8. Enter the variable details and click Submit.
   - Type: Wide Single Line Text
   - Name: description
   - Question: Please describe your symptoms

Define a basic transition

How to define a transition.

Note: To learn more, see *Wizard Transitions.*
Define transitions:
1. In the Wizard Panels related list, click Service Questions.
2. In the Wizard Panel Transitions related list, click New.
3. Enter the transition details and click Submit.
4. Repeat steps 2 – 3 for all panel transitions in the table.

Table 1101: Panel transition details table

<table>
<thead>
<tr>
<th>Condition</th>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>incident is Email Issue</td>
<td>Service Questions</td>
<td>Email Incident</td>
</tr>
<tr>
<td>incident is Computer Issue</td>
<td>Service Questions</td>
<td>Computer Incident</td>
</tr>
<tr>
<td>incident is Password Reset</td>
<td>Service Questions</td>
<td>Password Incident</td>
</tr>
</tbody>
</table>

Wizard concepts

Parts of and concepts of a wizard.
Wizards are built on the following concepts:
Table 1102: Wizards concepts

<table>
<thead>
<tr>
<th>Concept</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panels</strong></td>
<td>Screens that appear in a defined order. Each step in a wizard is represented by a panel. The available panel types are:</td>
</tr>
<tr>
<td></td>
<td><strong>Table 1103: Panel types</strong></td>
</tr>
<tr>
<td><strong>Panel</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>Wizard panel</td>
<td>prompts user to answer questions</td>
</tr>
<tr>
<td>Catalog checkout</td>
<td>displays an order confirmation screen</td>
</tr>
<tr>
<td>Catalog order</td>
<td>displays listings for service catalog items</td>
</tr>
<tr>
<td>KB viewer</td>
<td>displays a knowledge base article</td>
</tr>
<tr>
<td>Record generator</td>
<td>creates a record in a table</td>
</tr>
<tr>
<td>Survey</td>
<td>requires the Survey Wizard plugin</td>
</tr>
<tr>
<td><strong>Variables</strong></td>
<td>Questions that collect and store user input. Variables are defined in a wizard and can included on more than one panel.</td>
</tr>
<tr>
<td><strong>Transitions</strong></td>
<td>Define logic used to move between panels. Transition logic may be based on user input.</td>
</tr>
</tbody>
</table>

Advanced customization

An advantage of wizards is the ability to implement advanced, custom functionality with a user-friendly interface.

Create advanced wizards using:

- Wizard UI policy and client scripts: create dynamic effects and validation for wizards, panels, and variables.
- *wizard scripts*: run scripts from record generator panels, transitions, and UI policies.

Create an advanced wizard (demo)

This example creates a wizard that associates assets and details and then creates a contract with this information.

The wizard uses a script to create a new record.
Create the wizard

How to create the wizard.

1. *Activate the system wizards application*, if necessary.
2. Navigate to System Wizards Wizards.
3. Click New.
4. In the Name field, enter Contract Creation.
5. Right-click the header and select Save.

![Wizard creation](image)

Define a variable

How to define a variable.

1. In the Wizard Variable related list, click New.
2. Enter the variable details and save the record.
3. Repeat steps 1 – 2 for all variables in the table.

### Table 1104: Wizard Variables Details Table

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Question</th>
<th>Additional configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes/No</td>
<td>assets</td>
<td>Associate assets?</td>
<td></td>
</tr>
<tr>
<td>Select Box</td>
<td>contract_type</td>
<td>Which type of contract?</td>
<td>Mandatory: true&lt;br&gt;Choice table: Contract&lt;br&gt;[ast_contract]&lt;br&gt;Choice field: Contract type</td>
</tr>
<tr>
<td>Date</td>
<td>starts</td>
<td>Start Date</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>ends</td>
<td>End date</td>
<td></td>
</tr>
<tr>
<td>Single Line Text</td>
<td>short_description</td>
<td>Enter short description for contract</td>
<td></td>
</tr>
</tbody>
</table>
Create a panel demo

How to create the first two panels and add variables.

1. In the Wizard Panels related list, click New.
2. Select the panel Type of Prompts user to answer questions.
3. Enter the Name, then right-click the header and select Save.
4. In the Variables related list, click Edit....
5. Using the *slushbucket*, select and arrange the variables as listed in the table.

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Question</th>
<th>Additional configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>List Collector</td>
<td>asset_select</td>
<td>Asset Listing</td>
<td>List Table: Configuration Item[cmdb_ci]</td>
</tr>
</tbody>
</table>

Table 1105: Panel variables table

<table>
<thead>
<tr>
<th>Name</th>
<th>Add variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Contract Screen</td>
<td>Associate assets?</td>
</tr>
<tr>
<td></td>
<td>Which type of contract?</td>
</tr>
<tr>
<td></td>
<td>Start Date</td>
</tr>
<tr>
<td></td>
<td>End Date</td>
</tr>
<tr>
<td></td>
<td>Enter short description for contract</td>
</tr>
<tr>
<td>2 Asset Screen</td>
<td>Asset Listing</td>
</tr>
</tbody>
</table>

Create the third panel and add a field setter

How to create the third panel and add field setters.

1. In the Wizard Panels related list, click New.
2. Select the panel Type of Creates something (record generator).
3. Enter the following information, then right-click the header and select Save.
   - Name: 3 Contract No Assets
   - Table: Contract [ast_contract]
4. In the Field Setters related list, click New.
5. Enter the field setter details and save the record.
6. Repeat steps 4 – 5 for all field setters in the table.

Table 1106: Field setter details table

<table>
<thead>
<tr>
<th>Type</th>
<th>Field</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set field to a variable</td>
<td>Contract type</td>
<td>contract_type</td>
</tr>
<tr>
<td>Set field to a variable</td>
<td>Short description</td>
<td>short_description</td>
</tr>
</tbody>
</table>
Create the fourth panel and add a script

How to create the fourth panel and add a script.

1. In the Wizard Panels related list, click New.
2. Select the panel Type of Creates something (record generator).
3. Enter the following information, then right-click the header and select Save.
   - Name: 4 Create Contract and Assets
   - Table: Global
4. Paste the example script into the Script field. Configure the form to add the field, if necessary.

Example script:

```javascript
//Call the createContract function to obtain the ID of the created contract
var contract_id = createContract();

//Construct a url that will be used to redirect the user after submission
var uri = ('ast_contract.do?sysparm_query=sys_id='+ contract_id);

//Redirect the user to the url
wizard.redirect= uri;
gs.addInfoMessage('Contract created');

//Create a new contract
function createContract(){
    var cc = new GlideRecord('ast_contract');

    //set values from wizard variables - note the format wizard.variable
    cc.sys_class_name= wizard.contract_type;
    cc.starts= wizard.starts;
    cc.ends= wizard.ends;
    cc.short_description= wizard.short_description;
    var cntr = cc.insert();

    //We created a new contract and have the id so now we need the assets to associate
    associateAssets(cntr);
    return cntr;
}

//This is the way we loop through the elements in a list collector - assets in this case
function associateAssets(id){
    var items = wizard.asset_select.toString();
    items = items.split(',
    for(var i =0; i < items.length; i++){
        var sys_id = items[i];
        if(sys_id != ''){
            var rl = new GlideRecord('ast_contract_instance');
            rl.ast_contract= id;
            rl.ci_item= sys_id;
            rl.insert();}}}
```

<table>
<thead>
<tr>
<th>Type</th>
<th>Field</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set field to a variable</td>
<td>Ends</td>
<td>ends</td>
</tr>
<tr>
<td>Set field to a variable</td>
<td>Starts</td>
<td>starts</td>
</tr>
</tbody>
</table>
Define a transition (advanced demo)

How to define a transition.

1. Open a panel.
2. In the Wizard Panel Transitions related list, click New.
3. Enter the transition details and save the record.
4. Repeat steps 1 – 3 for all panel transitions in the table.

Table 1107: Panel transition details table

<table>
<thead>
<tr>
<th>Panel</th>
<th>Condition</th>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Contract Screen</td>
<td>assets is Yes</td>
<td>1 Contract Screen</td>
<td>2 Asset Screen</td>
</tr>
<tr>
<td>1 Contract Screen</td>
<td>assets is No</td>
<td>1 Contract Screen</td>
<td>3 Contract No Assets</td>
</tr>
<tr>
<td>2 Asset Screen</td>
<td></td>
<td>2 Asset Screen</td>
<td>4 Create Contract and Assets</td>
</tr>
</tbody>
</table>

Test the wizard for a record with no assets

Run through several scenarios to test transition logic and record generation.

1. Open the wizard record and click Test.
2. Enter the following information and click Next.
   - Associate assets?: No
   - Which type of contract?: select a value other than the default
   - Start Date: enter a date
   - End Date: enter a date
   - Enter short description for contract: enter a description
3. Verify that a new record is created and the values match step 2.
Test the wizard for a record with an asset

Test the wizard for a record with assets.

1. Open the wizard record and click Test.
2. Enter the following information and click Next.
   - Associate assets?: Yes
   - Which type of contract?: select a value other than the default
   - Start Date: enter a date
   - End Date: enter a date
   - Enter short description for contract: enter a description

3. Verify that the asset screen opens.
4. Select assets to add to the list and click Next.
5. Verify that a new record is created and the values match steps 2 and 4.
Publish the wizard demo

Restrict access to users with asset role.

1. Open the wizard.
2. In the Roles field, select asset and save the record.

Add the wizard as a module in the Asset Contracts application

Add the wizard as a module in the Asset Contracts application.

1. Open the wizard.
2. Copy the sys_id.
3. In the navigation pane, right-click Asset Contracts and select Edit Application.
4. In the Modules related list, click New.
5. Enter the following information and save the record.
   - Title: Create Contract
   - Order: 10
   - Link type: URL (from arguments)
   - Arguments: /expert_shell.do?sysparm_sys_id=<wizard sys_id from step 2>
Service Portal

Service Portal is a portal framework that allows administrators to build a mobile-friendly self service experience for users. It interacts with parts of the ServiceNow platform, so users can access specific platform features using Service Portal. It is an alternative to the Content Management System (CMS) based on more modern technologies.

Both expert developers and beginners can configure Service Portal.

Less technical users can make basic configuration changes to the UI using Branding Editor and other components of Service Portal. More advanced users can edit and extend portals, pages, and widgets. Expert users can use the Widget Editor tool to write scripts to power a portal, and even create rich web applications on the Now Platform.

**Explore**
- Service Portal release notes
- Upgrade to London
- Understanding Service Portal
- Service Portal core concepts
- Service Portal training on the ServiceNow Developer Portal
- Domain separation in Service Portal
- Service Portal search
- Configure a portal header menu
- Content Management and Service Portal

**Set up**
- Set up Service Portal on page 2642
- Service Portal search on page 2856
- Configure a portal header menu on page 2660
- Content Management and Service Portal on page 2614

**Administer**
- Single sign-on, logins, and URL redirects on page 2879
- Service Portal security on page 2879
- Automated test framework for Service Portal forms
- Automated Test Framework for Service Catalog in Service Portal
- Activate guided tours for Service Portal

**Use**
- Service Portal pages on page 2665
- Widget library on page 2688
- Page navigation by URL on page 2683

**Develop**
- Widget developer guide on page 2807
- Service Portal SCSS Primer on page 2893
- Developer training
- Developer documentation

**Troubleshoot and get help**
- Ask or answer questions in the Service Portal community
- Search the HI Knowledge Base for known error articles
- Contact ServiceNow Support
- Ask the developers
Understanding Service Portal

Service Portal provides a modular user interface framework for quick and easy building of application portals and dashboards for the platform. It helps developers and non-technical administrators create attractive and engaging user experiences that drive employee adoption of critical enterprise applications.

How do you use Service Portal?

Service Portal is an application included in the platform UI, however it includes a visual layer for you to do most of your configuration. In the application navigator, navigate to Service Portal Service Portal configuration to view the configuration page.

The Service Portal configuration page provides a unique, intuitive way of viewing all the pieces of your portal and how they interact with one another. The configuration page allows you to take advantage of a real-time preview, while configuring portal settings. Use each of the tiles on the configuration homepage to assemble the different components of your portal.

If you prefer the platform layout for configuring Service Portal, you still have the option of creating your portal components within the platform UI. The two options are not separate. Everything you create in the Service Portal configuration page also appears in a table in the platform UI.

Who uses Service Portal?

Several different kinds of users can configure a portal.

- Limited coding: Service Portal was designed so that even users with limited coding ability or knowledge of the platform UI could set up a portal.
- ServiceNow Experts: Users with an understanding of the ServiceNow platform can create portals, set up URL redirects, and view all the components of the portal in a table. Most portal configuration takes place in the Service Portal configuration page, but in specific circumstances, Service Portal administrators may need to do additional configuration directly within the platform.
- Developers: Advanced customizations and new widget creation are tasks for a developer or someone who understands AngularJS and Twitter bootstrap.

In all cases, the user configuring a portal must have the admin or sp_admin role.

Basic concepts

You should have a basic understanding of all the following components that make up a portal:

- **Themes**: Themes define the look and feel of the whole portal, but can be overridden by other style configurations.
- **Pages**: Pages control where and how you store portal content. Pages do not have a defined relationship to portal records, they simply exist.
- **Widgets**: Components in Service Portal are called widgets. You can use HTML templates, CSS, client scripts, server scripts, and any JavaScript dependencies to define what a widget does. From an AngularJS standpoint, widgets are essentially a superset of an Angular directive.
- Most of the data in Service Portal is managed in different locations throughout the system.

For example, if you are building a knowledge portal, the data exists in Service Portal, but the knowledge articles are authored and managed in the Knowledge application. The same is true for any other type of
content you plan to leverage. Take time to understand which tables contain and control the data you are working with in Service Portal.

Additional resources

Service Portal is built using several well known technologies. Use the following websites as resources to help you understand and configure your portal:

- Twitter Bootstrap
- CSS 3 Flexbox
- AngularJS

Service Portal core concepts

Service Portal contains two parts: a framework and a portal. The framework is composed of a set of APIs, Angular services, directives, and tools that help to build portals. The portal is a group of pages linked by page IDs.
After you enter a URL, the framework uses the suffix and picks the appropriate portal to determine the theme and configurations. Then it loads the configured default portal homepage unless the URL has a specified ID.

Each widget added to a page becomes its own instance. A widget instance is basically the application of a widget in a page. Because widgets are reusable and can appear on different pages to do different things, the manifestation of a widget on a page is referred to as a Widget Instance. The page loads with content represented by widgets.

Widget instances get their logic from the base widget template, client scripts, server scripts, and depending on the widget, CSS.
Activate Service Portal

If Service Portal is not active on your instance, you can activate it from the plugin module. You must have the administrator role to activate a plugin.

Locate the Service Portal for Enterprise Service Management [com.glide.service-portal.esm] plugin in the list of plugins. Activate the plugin and select the option to include demo data. For more information on activating a plugin, see the Activate a plugin topic.

Activating Service Portal automatically activates the following plugins:

- Service Portal - Knowledge Base [com.glide.service-portal.knowledge-base]
- Service Portal - Service Catalog [com.glide.service-portal.service-catalog]
- Service Portal - Service Status [com.glide.service-portal.service-status]
- Service Portal Configuration Pages [com.glide.service-portal.config]
- Service Portal Designer [com.glide.service-portal.designer]
- Service Portal Social QA [com.glide.service-portal.sqanda]
- Service Portal Surveys [com.glide.service-portal.survey]

Content Management and Service Portal

Service Portal is a compelling alternative to the Content Management System (CMS) with a refined user experience. It does not duplicate CMS or platform UI functionality. Users who have sophisticated experiences delivered through CMS may need to invest time into transitioning to Service Portal, especially if the CMS implementation includes complex and customized Service Catalog forms.

Service Portal compatibility with existing CMS sites

ServiceNow continues to support CMS in current and upcoming releases. If you have existing CMS sites and activate Service Portal on your instance, your CMS sites will continue to work, as CMS and Service Portal are separate applications.

Differences between Service Portal and CMS

Service Portal is an alternative to CMS based on more modern technologies. Major differences include:

**Underlying technology**

CMS uses Jelly, which is not a widely used technology. Service Portal instead uses AngularJS, server-side JavaScript, HTML, and CSS. Any scripts that use Jelly do not work in Service Portal. Building widgets in Service Portal requires knowledge of AngularJS.

**Visual layer**

CMS uses iFrames which can be difficult to work with, limited in terms of styling, and susceptible to upgrade issues. Service Portal, on the other hand, is a self-contained application that accesses data from other tables on the platform. This enables fine-tuned control over style and responsive design.

**Mobile first**

Unlike CMS, Service Portal is optimized for a mobile environment. For this reason, the following apply to the Service Portal environment:
• Any scripts used in Service Portal can only use APIs supported in a mobile environment. For example, some APIs used in your Service Catalog client scripts may not be supported. For a list of supported APIs, see Service Portal and client scripts on page 2635.

• Service Portal forms support a maximum of two-columns. As a result, any highly customized Service Catalog forms, such as catalog items and record producers that use containers and variable sets, must be simplified to work in a two-column layout.

If transitioning to Service Portal, review the following resource: Mobile client GlideForm (g form) scripting and migration.

To understand how core CMS components are configured in Service Portal, refer to the following table.

Table 1108: CMS and Service Portal components

<table>
<thead>
<tr>
<th>CMS component</th>
<th>Service Portal equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content site</td>
<td>Portal</td>
</tr>
<tr>
<td>Content page</td>
<td>Page</td>
</tr>
<tr>
<td>Content types</td>
<td>Content types link a table to a content page. In Service Portal, content types are no longer required. Record data is queried and displayed using base system widgets. You can add widgets to any number of Service Portal pages. Learn more: Service Portal widgets on page 2688.</td>
</tr>
<tr>
<td>Layout and dropzones</td>
<td>In Service Portal, pages are made up of containers, rows, and columns. Learn more: Pages.</td>
</tr>
<tr>
<td>Content block</td>
<td>A content block is a reusable piece of content. In Service Portal, content blocks are replaced by widgets. Learn more: Service Portal widgets on page 2688.</td>
</tr>
<tr>
<td>Service Catalog</td>
<td>Service Catalog pages are rendered using the SC Catalog Item widget in Service Portal. For this reason, Service Catalog forms such as catalog items and record producers are shared between your CMS implementation and Service Portal. If you have a highly customized Service Catalog, you may need to invest time in simplifying your Service Catalog items and client scripts so that they render as expected in Service Portal. Learn more: Service Catalog forms in Service Portal on page 2620.</td>
</tr>
<tr>
<td>Theme</td>
<td>Theme</td>
</tr>
<tr>
<td>CSS</td>
<td>CSS</td>
</tr>
</tbody>
</table>
CMS and Service Catalog customizations

Service Portal comes with base system widgets to address common use cases and to display record data. Even though there is no direct migration path from CMS to Service Portal, there may be some items, such as catalog items or knowledge articles, that render as expected in Service Portal without any effort.

However, because Service Portal is supported in a mobile environment, you may need to modify any customized forms and scripts. This approach ensures that the items display well on a mobile device and present a better user experience. Before transitioning to Service Portal, you may need to:

- Refactor client scripts used in your CMS/Service Catalog to use supported mobile APIs and global objects. For a list of supported APIs, see Service Portal and client scripts on page 2635.
- Build widgets to replace UI Macros and other unsupported scripts. If using a UI Macro in a catalog item form and referencing values on the form, you can use the following workaround instead: Replace a Service Catalog form script with a widget on page 2633.
- Simplify any complex forms used in your Service Catalog to fit the Service Portal two-column form layout.
- Consider which release supports the required functionality. You may want to upgrade your instance before transitioning to ensure that you have the required base system features.

CMS to Service Portal transition

Your CMS may include complex forms and customizations that do not render as expected in Service Portal. Use this guide to understand how best to modify your CMS and Service Catalog implementation for Service Portal adoption, and to understand how a conversion may affect your users.

If you are considering transitioning from CMS to Service Portal, make sure that you understand the impact of moving to a mobile environment. Review the Mobile client GlideForm (g form) scripting and migration.

Support level and transition actions

<table>
<thead>
<tr>
<th>CMS component</th>
<th>Service Portal support</th>
<th>Possible transition actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data lookups</td>
<td>The client-side component of a data lookup is not supported in Service Portal. However, the data lookup is applied in the platform when a record is submitted or updated in Service Portal.</td>
<td>While data lookups are not applied in the Service Portal, the record updates as expected in the platform UI when submitted or updated in the Service Portal. If your CMS is used by requesters only, this limitation may not affect your implementation.</td>
</tr>
<tr>
<td>Content blocks</td>
<td>Because Content blocks use Jelly, they are not supported in Service Portal.</td>
<td>In the Service Portal, content blocks are replaced by widgets. Widgets are highly customizable components that can query record data, display and update records, and gather user input. Base system widgets generally cover most use cases. Just as you add content blocks to a page in your CMS, you can add widgets to a page using the Service Portal Designer.</td>
</tr>
<tr>
<td>CMS component</td>
<td>Service Portal support</td>
<td>Possible transition actions</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------------</td>
<td>----------------------------</td>
</tr>
</tbody>
</table>
| UI Macros     | Because UI Macros use Jelly, they are not supported in Service Portal. | • In Service Portal, you can use widgets instead of UI Macros. Base system widgets generally cover most use cases, but for custom solutions, you can develop new widgets using AngularJS.  
• If your implementation includes UI Macros in Service Catalog forms that reference other fields or variables in the form, you can embed the widget inside a Service Catalog variable. Learn more: Replace a Service Catalog form script with a widget on page 2633. |
| UI actions    | All server-side UI actions are supported in Service Portal, although setRedirectURL() operations are ignored because Service Portal forms handle redirection in a different way than the platform.  
The form widget ignores all UI actions marked as Client. | • Refactor any UI actions to remove setRedirectURL() operations.  
• Check that UI actions are not marked as client. |
<table>
<thead>
<tr>
<th>CMS component</th>
<th>Service Portal support</th>
<th>Possible transition actions</th>
</tr>
</thead>
</table>
| Catalog client scripts | Only UI Type options Mobile / Service Portal and All are supported. UI type Desktop is not supported in Service Portal. For a list of supported APIs, see Service Portal and client scripts on page 2635. | • Update your scripts to remove any unsupported client APIs.  
• Check that the script UI Type is set to Mobile / Service Portal or All.  
Note: Synchronous JavaScript calls are not supported in Service Portal and must be replaced by asynchronous calls. For example, the getXMLWait() method of the GlideAjax class is not supported in Service Portal. Instead, use one of the following supported asynchronous methods:  
• getXML(Function callback)  
• getXMLAnswer(Function callback)  
For additional information on GlideAjax, refer to GlideAjax. |
| UI policies         | Scripted UI policies can only use APIs supported in Service Portal. For a list of supported APIs, see Service Portal and client scripts on page 2635.                                                                 | Update your scripts to remove any unsupported client APIs.  
To understand the impact of updating your CMS to work in a mobile environment, review Mobile client GlideForm (g form) scripting and migration. |
<table>
<thead>
<tr>
<th>CMS component</th>
<th>Service Portal support</th>
<th>Possible transition actions</th>
</tr>
</thead>
</table>
| Service Catalog variables | Service Catalog variables are supported in Service Portal with the following exceptions:  
• UI Macros and UI pages variable types are not supported.  
• Validation Scripts for variables are not supported. Supported validation types include:  
  • The Mandatory field on the variable form.  
  • Read-only variables.  
  • All fields in the Availability tab of the variable form.  
• Default variable size is not supported.  
• Expanding and collapsing help text is not supported. Rather, the Help text and Instructions fields defined in the Annotations tab on the variable form are always expanded. The Help tag does not display.  
• The List Collector variable displays as a choice list instead of a slushbucket in the Service Portal. | • If embedding a widget in a catalog item form, you can use the UI Macro variable type. Learn more: [Replace a Service Catalog form script with a widget](on page 2633).  
• If using variable with annotations, make sure to test your catalog items in Service Portal to ensure that help text displays as expected. |
| Order guides           | Order Guides in Service Portal use the Order Guide widget.                                                                                                                                                               | Large order guides can cause performance issues in the Service Portal. If you have large order guides, you can:  
  • Break them into multiple order guides.  
  • Simplify variables used in the order guides.  
  • As a temporary solution, you can render the Service Catalog item using an iFrame. See [Service Catalog forms in Service Portal](on page 2620). |
| Record producers       | Record producers are used in Service Portal with the following differences:  
• The sort order for catalog items in record producers is not honored.  
• Date values do not honor time zone when the record producer submits a record. | Make sure to test all record producers used in Service Portal to make sure that they behave as expected.                                                                                                                   |
<table>
<thead>
<tr>
<th>CMS component</th>
<th>Service Portal support</th>
<th>Possible transition actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Login scenarios and redirects</td>
<td>In CMS, you used the CMSEntryPage script include to define login scenarios. Instead, Service Portal uses the SPEntryPage script include and related system properties to define login scenarios. Redirects are not supported in Service Portal.</td>
<td>In Service Portal, define login behavior by modifying the SPEntryPage script include and setting system properties. For more information, see Single sign-on, logins, and URL redirects on page 2879.</td>
</tr>
<tr>
<td>Service Catalog forms</td>
<td>Service Catalog forms such as catalog items and record producers are rendered within widgets in a two-column layout. Complex forms may not display as expected.</td>
<td>• Simplify any complex forms in your Service Catalog. • As a temporary solution, you can render the Service Catalog item using an iFrame. See Service Catalog forms in Service Portal on page 2620.</td>
</tr>
<tr>
<td>Shopping cart</td>
<td>The Service Portal includes a base system Shopping Cart widget.</td>
<td>Use the Shopping Cart widget.</td>
</tr>
</tbody>
</table>

Service Catalog forms in Service Portal

Service Catalog forms are rendered within Service Portal widgets in a two-column layout. Complex forms may not display as expected.

Recommendations when creating Service Catalog forms

Use the following recommendations as a guide to building scalable forms that can be used in both applications:
• Keep forms simple. Because forms with multiple containers, variable sets, and client scripts do not always display as expected in Service Portal, keep forms short to eliminate conversion and debugging issues.
• Think in mobile. Any support for Catalog Client Scripts or Catalog UI Policies is the same as in mobile. Review the following resource: Mobile client GlideForm (g form) scripting and migration.

Form rendering in Service Portal

Containers and variable sets within Service Catalog forms are translated into a two-column layout when implemented in Service Portal. Service Catalog forms are rendered in Service Portal using the following rules:

• Only the top-level container settings are honored. If there are other containers within the top-level container, they are rendered as a single column. If there are container splits or nested containers within these additional containers, they are rendered as a single column. A top-level container is not a child of any other container.
• There can be a maximum of two columns in Service Portal. If your implementation includes forms with more than two columns, the fields are reorganized into two-columns in Service Portal.
• Variable sets are treated as containers. All previously listed rules apply to variable sets as well as any containers within them.
• Default variable size is not supported in Service Portal.

For other forms in the platform, the view determines how the form displays in Service Portal. For base system tables, the form opens in the Service Portal using the Service Portal table form view.

Example layout conversions

The following examples demonstrate how Service Catalog forms display in Service Portal.

Single-column form

A Service Catalog form with:
• Two containers.
• A single-column layout.
In Service Portal, the single-column layout renders as expected.

Figure 494: Service Catalog form
Two-column layout with subcontainers

A Service Catalog form with:
- A container with a two-column layout.
- A subcontainer with a single-column layout.
- A subcontainer with a two-column layout.

Figure 495: Service Portal result
Figure 496: Service Catalog form

In Service Portal, the two-column layout setting of the subcontainer is ignored. The subcontainer renders as a single column.
Two-column layout with variable sets and subcontainers

Figure 497: Service Portal result

A Service Catalog form with:
- Containers with single-column and two-column layouts.
- Variable sets with a two-column layout within containers.
In Service Portal, the two-column layout settings of the variable sets are ignored when inside a container column.
<table>
<thead>
<tr>
<th>Container1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable1</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>VariableSet1</td>
</tr>
<tr>
<td>Variable5</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Variable6</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Variable2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Container2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable3</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>VariableSet2</td>
</tr>
<tr>
<td>Variable7</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>VariableSet3</td>
</tr>
<tr>
<td>Variable8</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Variable3</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Variable4</td>
</tr>
</tbody>
</table>

**Figure 499: Service Portal result**
Containers within variable sets

A Service Catalog form with:

- Variable sets with single-column layouts.
- A container with a single-column layout with a container split within a single-column variable set.
- A container with a two-column layout within a single-column variable set.

Figure 500: Service Catalog form
In Service Portal, the container split and two-column container settings are ignored when inside a single-column variable set.
<table>
<thead>
<tr>
<th>Variables</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>VariableSet1</td>
<td></td>
</tr>
<tr>
<td>Container1</td>
<td></td>
</tr>
<tr>
<td>Variables2</td>
<td></td>
</tr>
<tr>
<td>Variables3</td>
<td></td>
</tr>
<tr>
<td>Variables4</td>
<td></td>
</tr>
<tr>
<td>VariableSet2</td>
<td></td>
</tr>
<tr>
<td>Container1</td>
<td></td>
</tr>
<tr>
<td>Variables5</td>
<td></td>
</tr>
<tr>
<td>Variables6</td>
<td></td>
</tr>
<tr>
<td>Variables7</td>
<td></td>
</tr>
<tr>
<td>Variables8</td>
<td></td>
</tr>
</tbody>
</table>
Nested containers

A Service Catalog form with:

- Containers that contain variable sets.
- Variable sets that contain nested containers.

Figure 502: Service Catalog form

In Service Portal, nested container formatting is ignored and displays as a single-column.
<table>
<thead>
<tr>
<th>Container1</th>
<th>VariableSet1</th>
<th>VariableSet2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NestedContainer1</td>
<td></td>
</tr>
<tr>
<td>Container2</td>
<td>Variable1</td>
<td>NestedVariable6</td>
</tr>
<tr>
<td></td>
<td>NestedVariable6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NestedVariable6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NestedVariable6</td>
<td></td>
</tr>
<tr>
<td>Variable4</td>
<td>NestedContainer2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NestedVariable6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NestedVariable6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NestedVariable6</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 503: Service Portal result**
Render a complex form in Service Portal using an iFrame

Because complex forms do not display as expected in Service Portal, you can render catalog items, record producers, and order guides in Service Portal using an iFrame. This workaround is a temporary solution to enable your Service Portal to function as expected while you simplify any complex Service Catalog forms.

When rendering items in an iFrame in Service Portal, the following limitations apply:

- On catalog items and record producers, the attachment icon is not visible. As a result, users cannot attach any files during the submission. As a workaround, you can add the attachment button to your form.
- Click-through for the hover-over icon is not available.
- Forms are not optimized for a mobile environment.

Use the attached resources and follow the instructions detailed in the Community post: Service Catalog on Service Portal.

Note: Be sure to make changes in a test environment before updating your production instance.

Replace a Service Catalog form script with a widget

You can use widgets in Service Portal to replace UI Macros. If your Service Catalog form includes a UI Macro that references other fields or variables on the form, you can create a widget to hold reusable code and embed it within the Service Catalog form. Use special syntax to access any variable fields on the form.

Role required: admin or sp_admin

1. Create a widget that performs the action you would like to use in catalog item forms. See step 7 for a simple example widget that accesses another variable on the form.
2. Open a catalog item that previously used a UI Macro or other reusable component not supported in Service Portal.
3. In related lists, add a new variable to the catalog item.
4. Configure the variable form to add the Widget field.
5. In the Type field, select Macro.
6. In the Widget field, select a widget that performs the desired action.
7. Use the $scope.page.g_form() or $scope.page.field syntax in the embedded widget to access the catalog item values.

This example shows how to modify the value of a single-line text variable with the name color associated with the catalog item.

**Widget HTML Template**

```html
<div>
  Data from catalog variable:
  <h1>{{ c.data.message }}</h1>
</div>
```

**Widget client script**

```javascript
function($scope) {

  var c = this;

  //Watch for changes in the color variable
  $scope.$watch(function () {
    return $scope.page.g_form.getValue('color');
  }, function (value) {
```

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You can use the following to access variable or catalog item fields:

- `$scope.page.g_form()`: The `g_form` instance on the form. You can use all supported `g_form` methods described in *Service Portal and client scripts* on page 2635. For example, `g_form.setValue('variable_name', 'new value');`.
- `$scope.page.field()`: The object that represents the variable.

When you open the catalog item in the Service Portal, the embedded widget accesses the variable fields associated with the catalog item.

**Supported features in Service Portal**

Service Portal is an alternative presentation layer for the platform. As such, not all features of the platform are extended to Service Portal. Consider your full application and the abilities of Service Portal before making considerable investments.

**Not currently supported**

- Domain separation

**No plans to support**

- @ Mentions
- Click-through/pop-ups
- UI macros
• Formatters
• UI actions marked as Client
• Nested container Catalog variables
• Survey wizards

Service Portal and client scripts

You can use client scripts and catalog client scripts in the Service Portal if the UI Type is set to Mobile / Service Portal or All. Client scripts and catalog client scripts are used with the Form widget and SC Catalog Item widget, as opposed to a widget client controller.

Before flagging a script as Mobile/Service Portal or All, make sure that you are only using the mobile APIs. Setting a client script to Mobile does not ensure that it will work, it simply flags that the script should be attempted by the mobile app or the Service Portal. Many of your existing client scripts can be set to All as long as the API calls are supported by the mobile client scripting environment.

The topics in this section require advanced coding knowledge and an understanding of Service Portal APIs.

Checking desktop vs mobile runtime

You might want to mark a client script compatible with both desktop and mobile, but include behavior that depends on the runtime. You can use this script:

```javascript
if (window === null)
    // Write your mobile compatible code here
else
    // Write your desktop compatible code here
```

Unsupported client scripting globals

Widget client controllers are full Angular controllers and are not subject to the unsupported client script globals listed here. Use jQuery and Angular as needed.

The following globals and APIs are unavailable in client scripts and catalog client scripts used in the Service Portal:
• window
• document
• $
• jQuery
• $$
• $j
• angular

Embedded widgets & g_form

When using the Service Catalog variable type Macro and Macro with Label, you can pick a widget to embed in a catalog item form. Within the client controller for the embedded widget you can access the field object and catalog item g_form instance using:

• $scope.page.field
• $scope.page.g_form()
**g_list and g_service_catalog in client scripts used with Service Portal**

The `g_list` global helps you set the filter of a Glide list element or a list collector variable. Use this API in place of the `g_filter` API on desktop client scripts.

```javascript
function onLoad() {
  var myListCollector = g_list.get("my_list_collector");
  myListCollector.reset();

  myListCollector.setQuery("active=true^category=8c7b22230b402200b0b02c6317673a62");
  myListCollector.addItem('3a700d39af5f4fc0aab978df90f4c692', 'Power Supply');
  myListCollector.addItem('1cb93419a3a248318da8f814140b42f6', 'Backpack');
}
```

`g_service_catalog` is only available in Service Portal service catalog item scripts. Use this API to know if your catalog item script is run as part of an order guide or on its own.

```javascript
function onLoad() {
  if (window) // if CMS, don't run this
    return;

  // g_service_catalog api for Service Portal and Mobile
  var isOrderGuide = g_service_catalog.isOrderGuide();
  g_form.setValue("is_order_guide", isOrderGuide ? "Yes!" : "Nope :(");
}
```

**Supported client script types and APIs**

Some client scripts are not supported in Service Portal. Others must have a UI type set to All or Mobile / Service Portal. If using a client script in the Service Portal, only client-side APIs supported in a mobile environment can be used.

**Client script support in Service Portal**

<table>
<thead>
<tr>
<th>Client script</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catalog client scripts</td>
<td>Service Portal requires that the UI Type field be set to All or Mobile / Service Portal. Client Scripts marked as Desktop rely on legacy APIs that are not supported in Service Portal. Before flagging a script as Mobile / Service Portal or All, make sure you are only using supported client-side APIs.</td>
</tr>
<tr>
<td>Client script</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Validation scripts</td>
<td>Service Portal requires that the UI Type field be set to All or Mobile / Service Portal. Client Scripts marked as Desktop rely on legacy APIs that are not supported in Service Portal. Before flagging a script as Mobile / Service Portal or All, make sure you are only using supported client-side APIs. Validate user input in a specific field type using a validation script. In new instances, Service Portal includes XML, Script, Script (Plain), Email, and Version validation scripts by default. If upgrading from a previous release, the Mobile and Service Portal version is not active by default. You must activate the Mobile and Service Portal version of the validation script to validate user input in the Service Portal. See <a href="#">Activate Service Portal validation scripts</a> on page 2641. <strong>Note:</strong> To call a UI script within a Validation script, use the g__ui_scripts global object. For more information, see <a href="#">GlideUI Scripts</a>. Verify that the UI script has the Global field set to false and UI Type set to Mobile / Service Portal or All.</td>
</tr>
<tr>
<td>UI scripts</td>
<td>Service Portal requires that the UI Type field be set to All or Mobile / Service Portal. Client Scripts marked as Desktop rely on legacy APIs that are not supported in Service Portal. Before flagging a script as Mobile / Service Portal or All, make sure you are only using supported client-side APIs.</td>
</tr>
<tr>
<td>UI Actions</td>
<td>All server-side UI actions are supported in Service Portal, although setRedirectURL() operations are ignored because Service Portal forms handle redirection in a different way than the platform. The form widget ignores any UI Actions marked as Client.</td>
</tr>
<tr>
<td>UI Policies</td>
<td>Supported, although you should use only declarative UI Policies. Avoid scripting unless the outcome cannot be achieved through the condition builder.</td>
</tr>
<tr>
<td>UI Macros</td>
<td>Not supported as UI macros use Jelly.</td>
</tr>
<tr>
<td>Formatters</td>
<td>Not supported as formatters use Jelly.</td>
</tr>
</tbody>
</table>
Supported client-side APIs

Supported client scripting APIs for use in onLoad, onChange, and onSubmit client scripts.
For detailed class and method information, see the API reference.
<table>
<thead>
<tr>
<th>Class</th>
<th>Available methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>g_form</td>
<td>• addDecoration(fieldName, icon, title)</td>
</tr>
<tr>
<td></td>
<td>• addErrorMessage(message)</td>
</tr>
<tr>
<td></td>
<td>• addInfoMessage(message)</td>
</tr>
<tr>
<td></td>
<td>• addOption(fieldName, value, label, index)</td>
</tr>
<tr>
<td></td>
<td>• clearOptions(fieldName)</td>
</tr>
<tr>
<td></td>
<td>• clearValue(fieldName)</td>
</tr>
<tr>
<td></td>
<td>• getActionName()</td>
</tr>
<tr>
<td></td>
<td>• getBooleanValue(fieldName)</td>
</tr>
<tr>
<td></td>
<td>• getDecimalValue(fieldName)</td>
</tr>
<tr>
<td></td>
<td>• getEncodedRecord()</td>
</tr>
<tr>
<td></td>
<td>• getFieldNames()</td>
</tr>
<tr>
<td></td>
<td>• getIntValue(fieldName)</td>
</tr>
<tr>
<td></td>
<td>• getLabel(fieldName)</td>
</tr>
<tr>
<td></td>
<td>• getReference(fieldName, callback)</td>
</tr>
<tr>
<td></td>
<td>• getRelatedListNames()</td>
</tr>
<tr>
<td></td>
<td>• getSectionNames()</td>
</tr>
<tr>
<td></td>
<td>• getSystId()</td>
</tr>
<tr>
<td></td>
<td>• getTableName()</td>
</tr>
<tr>
<td></td>
<td>• getValue(fieldName)</td>
</tr>
<tr>
<td></td>
<td>• hasField(fieldName)</td>
</tr>
<tr>
<td></td>
<td>• hideAllFieldMsgs(type: &quot;info</td>
</tr>
<tr>
<td></td>
<td>• hideErrorBox(fieldName)</td>
</tr>
<tr>
<td></td>
<td>• hideFieldMsg(fieldName, clearAll)</td>
</tr>
<tr>
<td></td>
<td>• hideRelatedList(listTableName)</td>
</tr>
<tr>
<td></td>
<td>• hideRelatedLists()</td>
</tr>
<tr>
<td></td>
<td>• isMandatory(fieldName)</td>
</tr>
<tr>
<td></td>
<td>• isNewRecord()</td>
</tr>
<tr>
<td></td>
<td>• isReadOnly(fieldName)</td>
</tr>
<tr>
<td></td>
<td>• isVisible(fieldName)</td>
</tr>
<tr>
<td></td>
<td>• removeDecoration(fieldName, icon, title)</td>
</tr>
<tr>
<td></td>
<td>• removeOption(fieldName, value)</td>
</tr>
<tr>
<td></td>
<td>• save()</td>
</tr>
<tr>
<td></td>
<td>• serialize(onlyDirtyFields)</td>
</tr>
<tr>
<td></td>
<td>• setFieldPlaceholder(fieldName, placeholder)</td>
</tr>
<tr>
<td></td>
<td>• setLabel(fieldName, label)</td>
</tr>
<tr>
<td></td>
<td>• setMandatory(fieldName, isMandatory)</td>
</tr>
<tr>
<td></td>
<td>• setReadOnly(fieldName, isReadOnly)</td>
</tr>
<tr>
<td></td>
<td>• setSectionDisplay(sectionName, isVisible)</td>
</tr>
<tr>
<td></td>
<td>• setValue(fieldName, value, displayValue)</td>
</tr>
<tr>
<td></td>
<td>• setVisible(fieldName, isVisible)</td>
</tr>
<tr>
<td></td>
<td>• showErrorBox(fieldName, message, scrollForm)</td>
</tr>
<tr>
<td></td>
<td>• showFieldMsg(fieldName, message, type: &quot;info</td>
</tr>
<tr>
<td></td>
<td>• showRelatedList(relatedTableName)</td>
</tr>
<tr>
<td></td>
<td>• showRelatedLists()</td>
</tr>
<tr>
<td></td>
<td>• submit(submitActionName)</td>
</tr>
</tbody>
</table>

**Note:** Using the variables.var_name notation with the g_form API is not supported in Service Portal. g_form as a global object cannot be used in a widget client controller or in a UI script.
<table>
<thead>
<tr>
<th>Class</th>
<th>Available methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>g_list</td>
<td>• get(fieldName)</td>
</tr>
<tr>
<td></td>
<td>• addItem(value, displayValue)</td>
</tr>
<tr>
<td></td>
<td>• removeItem(value)</td>
</tr>
<tr>
<td></td>
<td>• reset()</td>
</tr>
<tr>
<td></td>
<td>• setQuery(queryString)</td>
</tr>
<tr>
<td></td>
<td>• setDefaultOperator(operator)</td>
</tr>
<tr>
<td></td>
<td>• getDefaultValue()</td>
</tr>
<tr>
<td>g_service_catalog</td>
<td>isOrderGuide()</td>
</tr>
<tr>
<td>GlideAjax</td>
<td>• addParam(name, value)</td>
</tr>
<tr>
<td></td>
<td>• getParam(name)</td>
</tr>
<tr>
<td></td>
<td>• getXML(callback)</td>
</tr>
<tr>
<td></td>
<td>• getXMLAnswer(callback)</td>
</tr>
<tr>
<td></td>
<td>• getJSON(callback)</td>
</tr>
<tr>
<td></td>
<td>• setErrorCallback(errorCallback)</td>
</tr>
<tr>
<td></td>
<td>• getURL()</td>
</tr>
<tr>
<td></td>
<td>• getParams()</td>
</tr>
<tr>
<td></td>
<td>• execute()</td>
</tr>
<tr>
<td></td>
<td>• successCallback(data, status, xhr)</td>
</tr>
<tr>
<td></td>
<td>• errorCallback(xhr)</td>
</tr>
<tr>
<td></td>
<td>• setScope(scope)</td>
</tr>
</tbody>
</table>

**Note:** Because the mobile platform does not allow synchronous GlideAjax calls, the getXMLWait() method in a GlideAjax call does not work in the Service Portal. Instead, use one of the asynchronous calls such as getXML(Function callback) or getXMLAnswer(Function callback).
Activate Service Portal validation scripts

Validate user input in a specific field type using a validation script. In new instances, Service Portal includes XML, Script, Script (Plain), Email, and Version validation scripts by default. If upgrading from a previous release, the Mobile and Service Portal version is not active by default. You must activate the Mobile and Service Portal version of the validation script to validate user input in the Service Portal.

Role required: admin

Service Portal requires that the UI Type field be set to All or Mobile / Service Portal. Client Scripts marked as Desktop rely on legacy APIs that are not supported in Service Portal. Before flagging a script as Mobile / Service Portal or All, make sure you are only using supported client-side APIs. See Supported client script types and APIs on page 2636.

**Note:** To change the UI Type from Mobile / Service Portal to All, delete the Desktop version from your instance to avoid activating conflicting scripts. Before deleting the Desktop version, make a backup in case you need to revert any changes.

1. Navigate to System Definition Validation Scripts.
2. Open the Mobile / Service Portal version of the validation script you would like to use in the Service Portal.
3. Click the Active flag to activate the validation script.
4. Set the UI Type to All to use the validation script in desktop, mobile, and Service Portal environments. To avoid activating conflicting validation scripts, you must first delete the Desktop version of the script.
   a) Navigate to the desktop version of the validation script you would like to replace. Desktop versions have the UI Type field set to Desktop.
   b) Open the record.
c) Right-click the header menu and select Export XML (This Record) to create a backup of the record.
d) Once the export completes, click Delete and confirm the selection.
e) Navigate back to the validation script set to Active in earlier steps and change the UI Type to All.

User input into the designated field type in the Service Portal and Mobile environments is validated for correct formatting. For example, if you activated the Email validation script for use in the Service Portal, invalid user input into an Email field generates an error and prevents the browser from submitting the form.

Note: On a desktop browser, the field is validated when you submit the record. On a mobile browser, the field is validated when you navigate away from the field.

Domain separation in Service Portal

This is an overview of domain separation and the Service Portal. Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.

Overview

Support: Data only
Domain separation provides complete data isolation for domain-specific users. Domain separation in this application is supported at the Data only level, meaning it supports the data security model of separating visibility of data from one domain to another. To learn more, see Application support for domain separation.

How domain separation works in Service Portal

Elements of the Service Portal platform such as settings, portals, pages and widgets cannot be domain-separated. However, the data within widgets does display, based on domain. Separate portals with different URLs can be created to provide different experiences for different domains.

Set up Service Portal

Set up a site for your users using Service Portal.

Requirements


Role required: admin or sp_admin

Before you begin

Take the following into consideration before configuring Service Portal:

- Who are you building your site for and why?
• What information do you want to include in your site?
• What do you want the mobile experience to be for users?
• Which platform applications do you plan to use in your portal?

You can use parts of the platform, such as knowledge articles and catalog items, as the content for your portal.

For example, if you are building a knowledge portal, the content displays in Service Portal, but the knowledge articles are authored and managed in the Knowledge application. The same is true for any other type of content you plan to leverage. It is important to take time to understand the table structure of data to become acquainted with content.

• How customized is your service catalog? Catalog client scripts and UI policies only work in Service Portal if they use the mobile GlideForm API, so you may need to make some changes.

What to do

Create a portal

A portal is the engine that houses all the references to content for your site. The portal record defines the URL extension for a site, as well as things like the knowledge base, catalog, and homepage. You can also use the portal record to define the header menu and the portal branding.

From the Service Portal configuration page, click the New Portal tile. Use the fields on the form to associate pages to the portal.

• Create a portal on page 2647

Create a page

Pages are the centerpiece of the end user experience. Page definitions not only control the layout of the content, they craft the experience for the user. Pages also help define mobile responsiveness, which is a key component in the user experience.

Use any existing page included with Service Portal as an example for your own creation.

Use the Service Portal Designer to create pages, assign layouts, and add widgets.

• Create and edit a page using the Service Portal Designer on page 2668

Create a widget

Widgets are the power behind the portal. Widgets are highly customizable and can be used to provide an endless variety of experiences for your users. Anytime you add a widget to a page it becomes an instance of itself. Each widget instance has its own record so you can configure it specifically for each use. For example, you can add several Icon Link widgets to a page and configure them to link to different areas with different icons. None of the widgets are affected by the others.
You can start by cloning an existing widget and making changes to your cloned version. Developers with an advanced understanding of AngularJS can create widgets from scratch.

**Create a portal homepage**

When a portal is referenced by the URL suffix, it lands on a home page. This homepage is often labeled index in website language. The home page is probably the most important page of your portal as it houses the major information and actions that your users see.

- **Assign a homepage to a portal** on page 2674

**Configure the header menu**

The header menu in a portal is comprised of two separate widgets: a header widget, which determines the style of the header, and the menu widget, which determines the actual items that appear in the header. Configure both widgets for the header menu to appear and act like a header menu in your portal.

- **Create a portal header menu** on page 2661
- **Add a header or footer to a portal** on page 2661

**Configure the branding for the portal**

With the Branding Editor, you can configure the styles and theme of your portal in a view with real-time updates. You can see how your portal appears to users with the click of a button. More advanced users still have the option of creating CSS style sheets for the portal theme. However, they cannot take advantage of the real-time update that the Branding Editor provides. Changes made in the Branding Editor or to specific components of the portal (such as a widget or a page container) override any customizations made to the theme.

- **Configure portal branding** on page 2653
- **Create a portal theme** on page 2656

**Next steps**

- Configure search in the portal.
- Limit user access to specific components.
- Set up URL redirects.

**Service Portal configuration page**

Most Service Portal configuration is accessible through the Service Portal configuration page landing page. In your instance, access the Service Portal configuration page by navigating to Service Portal Service Portal configuration. The Service Portal configuration page opens in a new tab in your browser.
Service Portal
Create rich, engaging and modern experiences to help your business run better
Select one of the options below to continue

- **Branding Editor**
  - Customize your portal's title, logo and theme colors.
  - Preview changes as you make them

- **Designer**
  - Create and layout pages with drag-and-drop functionality.
  - Preview pages as you make changes

- **Page Editor**
  - Configure the properties of pages, containers and widgets from a map view

- **Widget Editor**
  - Create widgets from scratch or customize an existing one.
  - Write HTML, CSS, and Javascript with real-time preview

- **New Portal**
  - Create a new Service Portal

- **Get Help**
  - Browse guides, tutorials and videos to learn how to set up, configure and customize your portals
You can also access the configuration page by appending your URL with `sp_config`. For example, `https://<instance name>.service-now.com/sp_config`.

Use each option on the Service Portal config page to set up the different parts of your portal.

**Service Portal properties**

The Service Portal properties page provides several configuration options for Service Portal. Administrators can access these properties by navigating to Service Portal Properties.

**Table 1109: Service Portal Properties**

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default 404 page (page ID or <code>sp_page sys_id</code>) for Service Portal</td>
<td>Set the default page that your users see whenever a page cannot load properly.</td>
</tr>
<tr>
<td><code>glide.service_portal.default_404_page</code></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: 404</td>
</tr>
<tr>
<td></td>
<td>• Learn more: Assign a default error page on page 2677</td>
</tr>
<tr>
<td></td>
<td>The string must match the name of the page exactly</td>
</tr>
<tr>
<td>Enable Social Q&amp;A in Service Portal</td>
<td>Allow users to ask questions in a portal using the social Q&amp;A widgets.</td>
</tr>
<tr>
<td><code>glide.sp.socialqa.enabled</code></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td>Show a message to admin users in Service Portal pages if a browser error is encountered</td>
<td>• Type: true</td>
</tr>
<tr>
<td><code>glide.sp.show_console_error</code></td>
<td>• Default value: true</td>
</tr>
<tr>
<td>Maximum number of stream entries displayed in Service Portal</td>
<td>Limit the number of entries users can see in the ticket conversation widget. Users only see the most recent entries and cannot go further back in the history than the max allowed amount.</td>
</tr>
<tr>
<td>(activity widget, conversation widget, and so on)</td>
<td>• Type: integer</td>
</tr>
<tr>
<td><code>glide.service_portal.stream_entry_limit</code></td>
<td>• Default value: 100</td>
</tr>
<tr>
<td>Duration (in seconds) info and error messages persist in the Service Portal before auto-dismissal.</td>
<td>Set the duration in seconds that error and info messages remain on the screen before they are auto-dismissed. If set to 0, messages do not auto-dismiss and require that a user close them.</td>
</tr>
<tr>
<td><code>glide.service-portal.notification_timeout.seconds</code></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 5</td>
</tr>
<tr>
<td></td>
<td>If the glide.ui.accessibility preference is enabled, messages do not auto-dismiss, regardless of the system property value. To set this preference, see Enabling accessibility features.</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Default sort order for announcements</td>
<td>Define the sort order for banner announcements.</td>
</tr>
<tr>
<td>glide.service_portal.announcement.default.sort_order</td>
<td>Type: choice list</td>
</tr>
<tr>
<td></td>
<td>• Default value: Start Date Descending</td>
</tr>
<tr>
<td></td>
<td>Options include:</td>
</tr>
<tr>
<td></td>
<td>• Start Date Ascending: The oldest start date appears first.</td>
</tr>
<tr>
<td></td>
<td>• Start Date Descending: The most recent start date appears first.</td>
</tr>
<tr>
<td></td>
<td>• End Date Ascending: The oldest end date appears first.</td>
</tr>
<tr>
<td></td>
<td>• End Date Descending: The most recent end date appears first.</td>
</tr>
</tbody>
</table>

If `user criteria [com.glide.service-portal.user-criteria]` is enabled, the following properties also appear in the Service Portal properties page:

Table 1110: User criteria properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable use of User Criteria records instead of Roles fields for Service Portal entitlements glide.service_portal.user_criteria_enabled</td>
<td>Define permissions for Service Portal widgets, widget instances, pages, and search sources.</td>
</tr>
<tr>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td>• Default value: true</td>
</tr>
<tr>
<td></td>
<td>• More information: [User criteria for Service Portal] on page 2882</td>
</tr>
<tr>
<td>List of roles (comma-separated) that bypass User Criteria validation in Service Portal glide.sp.entitlement.override</td>
<td>Allow users with a specific role to see any page, widget, widget instance, or search source regardless of user criteria.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: admin</td>
</tr>
</tbody>
</table>

Create a portal

Create a portal using the Service Portal configuration page.

Role required: admin or sp_admin

The Branding Editor affects the look of your portal and essentially changes the CSS for the pages. The changes you make in the Branding Editor are recorded in the portal record in the following fields. If you have experience with CSS and HTML you can configure these fields in the portal form directly as accessed through the portal UI. By theming your portal in the Branding Editor instead, you can take advantage of the real-time theme preview.

1. Navigate to Service Portal Portals, then click New.
2. Complete the portal form using the following fields.

**Table 1111: Portal form fields**

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>The name you use to define your portal. In the browser header and for bookmarks, the title appears as <code>&lt;Portal Title&gt; - &lt;Page Title&gt;</code></td>
</tr>
<tr>
<td>URL Suffix</td>
<td>The value that appears appended to an instance URL when you access a portal. For example, if you use <code>sp</code>, the instance URL for that portal would be <code>&lt;instance name&gt;.service-now.com/sp</code>. Make sure this value is unique and is not the same as any other portal.</td>
</tr>
<tr>
<td>Homepage</td>
<td>The page you want users to see first after they sign in.</td>
</tr>
<tr>
<td>Knowledge base</td>
<td>Name of the knowledge base you want associated with the portal. The knowledge base you select here determines what information appears for the knowledge base page. For example, if you select <code>IT</code>, only the article categories defined for the IT knowledge base appear in the <code>KB categories widget</code>.</td>
</tr>
<tr>
<td>Social QA Knowledge Base</td>
<td>Name of the knowledge base where you want to store questions and answers from portal users.</td>
</tr>
<tr>
<td>KB home page</td>
<td>The home page you created that you want users to see when they go to a knowledge base.</td>
</tr>
<tr>
<td>Login page</td>
<td>The page you created for users to be authenticated.</td>
</tr>
<tr>
<td>Logo</td>
<td>Logo that appears in the page header. You can also configure the logo in the Branding Editor.</td>
</tr>
<tr>
<td>Icon</td>
<td>The icon that appears in the address bar for your portal. Each portal you create can have a different icon.</td>
</tr>
<tr>
<td>Default</td>
<td>The portal you want to use as your main portal.</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Quick start config | Schema that defines configuration items in the Branding Editor. In JSON format, you can define fields and records used to generate your branding options.  

```
[
    "tagline": {
        "table": "sp_instance",
        "sys_id": "34fe3d96cb20020000f8d856634c9cf4",
        "field": "title"
    },
    "hero_background": {
        "table": "sp_container",
        "sys_id": "be98a8d2cb20020000f8d856634c9c63",
        "field": "background_image"
    }
]
``` |
| CSS variables    | Portal-specific Sass variables. You can overwrite existing theme variables here.                                                                |
| Application      | Application scope. This field is uneditable and Global by default.                                                                               |
| 404 page         | The default page your users see whenever a page cannot load properly. You can also define a default 404 page using the system property glide.service_portal.default_404_page. |
| Catalog          | Catalog listed in the sc_catalog table to use in the portal.                                                                                      |
| Catalog home page | Catalog page that you created in the portal to represent the catalog.                                                                            |
| Main menu        | Reference to the menu in the [sp_instance_menu] table that appears in the header.                                                                |
| Theme            | Refers to a theme in the [sp_theme] table that defines the style and branding for the portal. The theme is the lowest level of style configuration and any changes made in the Branding Editor or to specific portal components (such as widget or container CSS) override those styles. |
### New Service Portal

**Title**
- Documentation portal

**URL suffix**
- doc_help

<table>
<thead>
<tr>
<th><strong>Homepage</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>index</td>
<td>x</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Knowledge base</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>x</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Social QA Knowledge Base</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Social QA</td>
<td>x</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>KB home page</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>kb_view2</td>
<td>x</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Login page</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>login</td>
<td>x</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Application</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Global</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>404 page</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>404</td>
<td>x</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Catalog</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Catalog</td>
<td>x</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Catalog home page</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>sc_home</td>
<td>x</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Main menu</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SP Header Menu</td>
<td>x</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Theme</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock</td>
<td>x</td>
</tr>
</tbody>
</table>
Associate a portal with a catalog

You can associate a portal with any catalog. Only one catalog can be associated with a portal. By default, Service Portal is associated with Service Catalog.

Role required: admin or sp_admin

1. Navigate to Service Portal Portals.
2. Click the Service Portal record.
3. In the Catalog field, select the desired catalog. The categories and catalog items associated with the selected catalog are displayed in Service Portal.
4. For the Main menu field, click Open Record.
5. From the Menu Items section, click the Service Catalog record.
6. In the Label field, specify the label for the selected catalog. The catalog label is displayed in the main menu of Service Portal.
7. Click Update.

Service Portal styles

Pages are made up of containers, columns, rows, widgets, and widget instances. You can configure the CSS of each component, or use the CSS defined in theme and branding as global definitions for the portal. If you do not define CSS in theme or branding, Bootstrap defaults are used.

You can define CSS in your portal at multiple levels.

**Bootstrap defaults**

If no other CSS is defined, all elements use Bootstrap version 3.3.6 defaults.

**Branding editor theme colors/Portal CSS**

CSS defined in the Branding Editor Theme Colors tab. Changes made to the theme colors in the Branding Editor appear in the CSS variables field in the portal table [sp_portal].
Customizing the theme colors overwrites the Bootstrap defaults.

**Theme CSS**
CSS defined in the CSS variables field in the Themes table `[sp_theme]`. Use the Theme CSS as much as possible to allow for more flexible evolution of your portal in the future.

Using a theme overwrites the Portal CSS/Branding Editor theme colors.

**Page CSS**
CSS defined in the Page Specific CSS field in the Pages table `[sp_page]`.

Page-specific CSS overwrites the theme CSS.

**CSS classes**
You can define CSS classes elements on the page within each respective record.

**Widget CSS**
CSS defined in the CSS field in the Widgets table `[sp_widget]`.

Widget CSS overwrites container, column, and row CSS.
**Widget instance CSS**

CSS defined in the CSS field in the Instance table [sp_instance].

Widget instance CSS overwrites all other CSS definitions.

---

**Figure 506: Hierarchy of style application in the Service Portal**

**Configure portal branding**

Use Branding Editor to give your portal its own look and feel.

To access the Branding Editor, navigate to Service Portal Service Portal Configuration, then click Branding Editor.

Select the portal you want to customize the theme for from the portal list. Then use the options on the Quick Setup and Theme Colors tabs to customize your portal.
Figure 507: Branding Editor

Table 1112: Quick Setup tab options

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portal Title</td>
<td>The name of your portal. Changing the name of the portal in the Branding Editor also changes the title on the portal form field in the platform UI.</td>
</tr>
<tr>
<td>Logo</td>
<td>The logo that appears in the header for your portal. This image is scaled to a maximum height of 46 px and a maximum width of 200 px.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Logo padding</td>
<td>Where you want the logo to sit in location to the edge of the header. This information is stored in the CSS variables section on the portal form.</td>
</tr>
<tr>
<td>Tag line &amp; background</td>
<td>Fields defined by the JSON schema in the Quick start config field on the portal record in the platform UI. The sample Service Portal adds Tag Line and Background to the Branding Editor using the following schema:</td>
</tr>
</tbody>
</table>
|                         | ```                                                                                              
|                         | [{                                                                                              |
|                         |   "tagline": {                                                                                  |
|                         |     "table" : "sp_instance",                                                                 |
|                         |     "sys_id" : "34fe3d96cb20020000f8d856634c9cf4",                                               |
|                         |     "field" : "title" }                                                                         |
|                         |   "hero_background": {                                                                            |
|                         |     "table" : "sp_container",                                                                  |
|                         |     "sys_id" : "be98a8d2cb20020000f8d856634c9c63",                                               |
|                         |     "field" : "background_image" }                                                               |
|                         | }]                                                                                              |
| Tag line                | Introduce your users to a portal page with a tag line. This text is stored in an instance of the homepage search widget.                                                                                                                                                   |
| Tag line color          | Select a color for the tag line.                                                                                                                            | |
| Homepage background color | Add a color for your background. You can type in a color name, hex color, decimal (RGB), or select from the color palate.                                                                                       |
| Background image        | Upload an image to appear in the background of your homepage. This image is stored in the container for the widget on your homepage.                                                                                             |

For any colors on the theme tab, you can use the standard color name, hex code, decimal (RGB) code, or select the color from the color palate. All the color definitions are stored in the CSS variables field of the portal form. The theme preview updates in real time as you make changes.

Table 1113: Theme colors tab

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Navbar</td>
<td>Use the fields in this section to customize the colors for the header menu.</td>
</tr>
<tr>
<td>Brand</td>
<td>Use the fields in this section to customize the page colors. For example, the page background or the widget background.</td>
</tr>
<tr>
<td>Text</td>
<td>Use the fields in this section to customize the color of the text on a page.</td>
</tr>
</tbody>
</table>
Changes made to the theme colors in the Branding Editor appear in the CSS variables field of the portal form in the platform UI.

Create a portal theme

If you need more customization than Branding Editor can provide, you can create your own custom theme. Only users with an understanding of CSS should create custom themes.

1. Navigate to Service Portal Themes, then click New.

2. Complete the form fields and select Save.
### Table 1114: Theme form fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of your theme. Use this name to associate the theme with your portal. This name is not visible to users, you should know it to apply the correct theme to a portal.</td>
</tr>
<tr>
<td>Application</td>
<td>The record scope. The header menu record and the source table must have the same application scope.</td>
</tr>
<tr>
<td>Header</td>
<td>List of headers and footers from the sp_header_footer table that you can associate with a portal theme. Headers and footers are widgets and can be configured the same way.</td>
</tr>
<tr>
<td>Footer</td>
<td>List of headers and footers from the sp_header_footer table that you can associate with a portal theme.</td>
</tr>
<tr>
<td>Fixed header</td>
<td>Locks the header at the top of the page so that when a user scrolls the header remains on the screen.</td>
</tr>
<tr>
<td>Fixed footer</td>
<td>Locks the footer at the bottom of the page so that when a user scrolls the footer remains on the screen.</td>
</tr>
<tr>
<td>CSS variables</td>
<td>CSS custom properties that you can use to change the color and styles in a portal. For example, the stock theme uses some of the following variables:</td>
</tr>
<tr>
<td></td>
<td>$sp-logo-margin-x: 15px !default;</td>
</tr>
<tr>
<td></td>
<td>$sp-tagline-color: $text-color !default;</td>
</tr>
<tr>
<td></td>
<td>$navbar-inverse-bg: #3a3f51 !default;</td>
</tr>
</tbody>
</table>

3. To add a style sheet to the theme, in the CSS Include related list, click New.
4. Complete the style sheet form fields, then click Save.

**Table 1115: Style sheet form fields**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the CSS Include. Remember this name to associate the CSS Include with the theme.</td>
</tr>
<tr>
<td>Application</td>
<td>The record scope. The header menu record and the source table must have the same application scope.</td>
</tr>
<tr>
<td>Source</td>
<td>Select one of the following options:</td>
</tr>
<tr>
<td></td>
<td>• Style Sheet: Add an internal style sheet that has been uploaded to the CSS table [sp_css]. For example, ng-sortable.min.css. Internal style sheets use standard CSS in the CSS field.</td>
</tr>
<tr>
<td></td>
<td>• URL: Link to an external style sheet. Use external style sheets to use the same CSS as a corporate website or other online resource.</td>
</tr>
<tr>
<td>Style sheet</td>
<td>Associate a style sheet or CSS file URL, depending on which option you select in the Source field.</td>
</tr>
</tbody>
</table>
5. To add a JavaScript include to the theme, in the JS Include related list, click New.

![JS Include record](image)

**Figure 509: CSS include record**

6. Complete the style sheet form fields.

**Table 1116: Style sheet form fields**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display name</td>
<td>Name of the CSS Include. Remember this name to associate the CSS Include with the theme.</td>
</tr>
<tr>
<td>Application</td>
<td>The record scope. The header menu record and the source table must have the same application scope.</td>
</tr>
<tr>
<td>Source</td>
<td>Select one of the following options:</td>
</tr>
<tr>
<td></td>
<td>• UI Script: Add an internal UI script that has been uploaded to the UI script table [sys_ui_script]. UI scripts allow you to create client-side JavaScript and reuse it in multiple locations. For more information on UI scripts, see <em>UI scripts</em>.</td>
</tr>
<tr>
<td></td>
<td>• URL: Link to an external JavaScript file. Use external URLs to use the same JavaScript as a corporate website or other online resource.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>UI Script or Java file URL</td>
<td>Associate an internal UI script or Java file URL, depending on which option you select in the Source field.</td>
</tr>
<tr>
<td>Updated</td>
<td>Date and time that the JS Include was last updated</td>
</tr>
<tr>
<td>Package</td>
<td>The Service Portal package that the JS include is associated with. For example, Service Portal Configuration Pages. This fields is populated by default.</td>
</tr>
</tbody>
</table>

Configure a portal header menu

Service Portal is designed to allow customers to have deep control over the behavior of their portals. One of the main navigation controls for users is the header main menu. The menu options are determined by the assignment of a main menu to the portal, but the look and behavior of the menu is defined within the theme and associated header.

Configuring a portal header with a menu involves several steps:

1. Create a header and add it to a theme.
   Until you add a theme with a header to a portal, the header menu does not display.

2. Create a main menu with menu items and assign it to the portal.
   The main menu record is where you assign which navigation options appear in the header. For example, you can add a menu item that links to another page within your portal, such as the service catalog.

The main menu and header form a header menu when associated with a theme and a portal.
Add a header or footer to a portal

Use the theme to add a header or footer to your portal.

1. Navigate to the portal theme (Service Portal Service Portal Configuration Portal Tables Themes) then click the theme you want to add the header or footer to.

2. In the header or footer field, select the header or footer you want to use for your portal.
   If you are just getting started, you can reuse the base system Stock Header or Sample Footer widgets.

3. Select Fixed Header or Fixed Footer to lock the header or footer in one place so when users scroll up or down they remain in the same location on the page.

4. To configure the appearance of the header, in the Service Portal configuration page, open the Branding Editor. Under the Theme Colors tab, use the color selectors in the Navbar section to control the colors in the header.

Create a portal header menu

Create a menu with menu items to display in the header of a portal.

1. In the Service Portal configuration page (Service Portal Service Portal Configuration), navigate to Portal Tables Instance with Menu and click New.

2. Complete the fields in the menu form.
Table 1117: Menu fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>Name of the header menu. You need to know this when you associate the menu with your portal.</td>
</tr>
</tbody>
</table>
| Additional options, JSON format | Advanced configuration options. For example, use this field to enable the shopping cart in the header menu with the following code:  
```json
{
  "enable_cart": {
    "displayValue": "true",
    "value": true
  }
}
``` |
| Application                   | The record scope. The header menu record and the source table must have the same application scope. |
| Widget                        | The widget that the header menu is based on. Select a menu-type widget from the list. For example, the header menu widget that is included as a base system widget. |

3. Save the form, and then click Menu Items from the related lists.
4. Click New and complete the menu item form.

Table 1118: Menu item fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Label</td>
<td>Name that appears for the item in the menu</td>
</tr>
<tr>
<td>Parent menu</td>
<td>This field should already contain the name of the menu you are adding items to. You can change the value as needed to other menus</td>
</tr>
<tr>
<td>Parent menu item</td>
<td>Use this field to nest menu items within other menu items</td>
</tr>
<tr>
<td>Order</td>
<td>Value that determines where the item appears in the menu in relation to other menu items</td>
</tr>
<tr>
<td>Type</td>
<td>The kind of page the item links to. For example, you can link to another page in the portal, or an external URL. Form fields vary depending on the option you select from this list. Select Scripted list for more advanced options.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td>Page</td>
<td>Name of the portal page the item links to. This option is available if you select Page as the menu item type.</td>
</tr>
<tr>
<td>Condition</td>
<td>Determines what conditions are required for menu items to show in the header. For example, the condition <code>gs.hasRole(&quot;sp_admin&quot;)</code> restricts access to menu items to users with the sp_admin role. Hide a menu item by setting this value to false. For more information on what conditions to use in the Condition field, see Create a UI action.</td>
</tr>
<tr>
<td>Glyph</td>
<td>Icon that appears beside the menu item</td>
</tr>
</tbody>
</table>

5. Click Submit.
6. After you create a menu and menu items, add the menu to a portal.
   a) Navigate to Service Portal Portals, then open the portal you want to add a menu to.
   b) From the main menu field, click the reference lookup icon, then select the appropriate menu by name.
Figure 510: Select a menu

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c) Click Save.

Associate the menu you created with a portal, then create a header with a theme for your menu.

**Service Portal pages**

Use pages to organize content, ensure responsive mobile optimization, and design meaningful portal user experiences for your customers. A page houses containers and rows, which then contain widgets. By manipulating the layout of the page, and the widgets within it, you can construct your desired user experience.

- Pages are referenced using the page ID.
- Pages can be referenced in more than one portal.
- Use base system pages as templates.
How can we help?

Order Something
Browse the catalog for services and items you need

Knowledge Base
Browse and search for articles, rate or submit feedback

Get Help
Contact support to make a request, or report a problem

Community
Community-sourced answers to your questions

Current Status
No system is reporting an issue

Popular Questions
No questions have been asked yet

My Approvals
You have no pending approvals

Top Rated Articles

Ask a Question

Rain is leaking on main DNS Server
00X084 - a day

Widget

Widget

Column

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Containers

Containers are markup artifacts that are put on a page to contain the layouts that house the widgets. You can view containers and how they make up a page in the Service Portal Designer (Service Portal Service Portal Configuration Designer). Open a page in the Service Portal Designer, then click anything on the page. In the top left corner, breadcrumbs appear to show you which element on the page you have selected. Use the breadcrumbs to select a container, then click the edit icon (edit icon).

Figure 512: Service Portal Designer breadcrumbs

You can also edit a container by navigating to the Page Editor and selecting the container node in the tree view. In this view, you can:

- Change the layout of widgets on a page.
- Determine the number of columns on a page.
- Determine whether to scale with changes to the browser window.
- Add a background color to a portion of a page.
- Add an background image to a portion of a page.
- View the current layout of the widgets within the page.
Create and edit a page using the Service Portal Designer

Create or edit a page and use layouts to organize the columns that house the widgets.

These steps are intended for users with little to no coding experience. The Service Portal Designer includes several layers of customization from simply adding widgets in a particular configuration on a page, to adding CSS classes.

1. Navigate to Service Portal Service Portal Configuration.
2. Click Designer.
3. Switch to the portal you want to design pages for by selecting the portal name in the header.
4. From the Service Portal Designer, select a page to customize or click Add a new page.
5. Under Layouts, select Container and drag it onto the page.
6. Drag one of the other layouts and drop it in the container.
   This layout defines the structure of your page and the space available to drop widgets. The structure of the layout aligns with the Bootstrap grid template and always adds up to 12.
7. Use the filter to search for a widget, then drag the widget to the layout.
Drag containers, layouts, then widgets onto a page.

Drag and drop a set of columns from the left pane or use the plus (+) button - then drag and drop widgets inside.
8. Edit page properties.
   a) Click Edit Page Properties.
      The page record from the Pages table [sp_page] opens.
   b) Edit the form.

   Table 1119: Page fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>Internal name of the page. Use the title to search for a page in the Service Portal Designer.</td>
</tr>
<tr>
<td>ID</td>
<td>A unique ID for the page. The ID is what you use to assign a page to a portal. It also determines the URL for the page, for example <a href="https://instance">https://instance</a> name.service-now.com/doc_portal/?id=doc_page, where doc_page is the page ID.</td>
</tr>
<tr>
<td>Application</td>
<td>The application scope.</td>
</tr>
<tr>
<td>Public</td>
<td>Enables the page to be accessed without the need for authentication. If Public is selected, all users can view the page no matter the roles listed.</td>
</tr>
<tr>
<td>Draft</td>
<td>Mark a page as draft to limit user ability to view the page while you are still creating it. Only users with the admin role can view a page in draft, all other users see a 404 page.</td>
</tr>
<tr>
<td>Roles</td>
<td>Limit user access to a page by role.</td>
</tr>
<tr>
<td>Short description</td>
<td>Describes the portal page. This field is not public facing.</td>
</tr>
<tr>
<td>Page Specific CSS</td>
<td>Unless a page has Page Specific CSS, the page inherits CSS from the Theme and Branding. If you need a page to look different, the Page Specific CSS overrides the inheritance from the Theme and Branding.</td>
</tr>
<tr>
<td>Dynamic page title</td>
<td>Create variables to generate descriptive titles depending on the content loaded into a page.</td>
</tr>
<tr>
<td>Clone Page</td>
<td>Enables you to make a copy of a page that can be modified. If you clone a base system page, a new widget instance is created for each widget on the page.</td>
</tr>
</tbody>
</table>

9. Edit container properties.
   a) Click within the container you would like to edit, or select Container in the breadcrumbs.
   b) Click the edit icon [edit].
      The container record from the Containers table [sp_container] opens.
   c) Edit the form.

   Table 1120: Container fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Internal name of the container.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Order</td>
<td>The order in which the containers appear on a page. To set a container to appear above all other containers, give the container the lowest number in the Order field.</td>
</tr>
<tr>
<td>Page</td>
<td>The page in which the container appears.</td>
</tr>
<tr>
<td>Screen reader title</td>
<td>The title used by a screen reader.</td>
</tr>
<tr>
<td>Application</td>
<td>The application scope.</td>
</tr>
<tr>
<td>Width</td>
<td>Width of the container. Options include:</td>
</tr>
<tr>
<td></td>
<td>- Fixed</td>
</tr>
<tr>
<td></td>
<td>- Fluid</td>
</tr>
<tr>
<td>Parent class</td>
<td>Parent CSS class for the container.</td>
</tr>
<tr>
<td>CSS class</td>
<td>The CSS classes for the container. Overwrites page-specific CSS.</td>
</tr>
<tr>
<td>Background color</td>
<td>The background color of the container.</td>
</tr>
<tr>
<td>Background image</td>
<td>Background image for the container.</td>
</tr>
<tr>
<td>Background style</td>
<td>The display style of a background image. Options include:</td>
</tr>
<tr>
<td></td>
<td>- Default</td>
</tr>
<tr>
<td></td>
<td>- Cover</td>
</tr>
<tr>
<td></td>
<td>- Contain</td>
</tr>
<tr>
<td></td>
<td>- Repeating</td>
</tr>
<tr>
<td>Bootstrap alternative</td>
<td>Selecting this field removes the standard Bootstrap grid classes and disables the Bootstrap grid system in the container. If selected, the following are not applied:</td>
</tr>
<tr>
<td></td>
<td>- The Width field in the container record.</td>
</tr>
<tr>
<td></td>
<td>- Standard Bootstrap class in the row record within the container.</td>
</tr>
<tr>
<td></td>
<td>- The Size - xs, Size - sm, Size - md, and Size - lg fields in column records within the container.</td>
</tr>
<tr>
<td></td>
<td>Only select this field if you plan to provide custom CSS classes and CSS for the container, row, and column records.</td>
</tr>
<tr>
<td>Move to header</td>
<td>If selected, the container sticks to the header and does not scroll. Use this option to create a subheader.</td>
</tr>
</tbody>
</table>

10. To switch to a different page, click the Pages tab in the left pane, then select the next page you want to configure.

11. Use the Preview button in the header to view your page as you design it. You can also use Preview to view your page in mobile or tablet mode through the controls presented in the header.
Figure 514: Designer tablet view
Add a subheader to a page

Select a container record to serve as a page subheader. A subheader sticks to the page header and does not scroll.

Role required: admin

1. From the Service Portal configuration page (Service Portal Service Portal Configuration) open the Service Portal Designer.
2. Open the page you want to add a subheader to.
3. Click the container that you would like to use as a subheader, or select the container using the breadcrumbs.
4. Click the edit icon (редактировать).
5. Select Move to header.
Assign a homepage to a portal

Edit your portal record to specify any page as your homepage.

When a portal is referenced by the URL suffix, it lands on a home page. This homepage is often labeled index in website language. The home page is probably the most important page of your portal as it houses the major information and actions that your users see.

1. From any page in the Service Portal Designer, click Edit Portal Properties.
Figure 516: Edit Portal Properties

2. From the Homepage list, select the page you want for your portal homepage and click Save.
Figure 517: Select a homepage
Assign a default error page

Create a default 404 error page for your portal using a system property.

You can assign an error page to a portal using the portal form. If you do not assign an error page using that form, the system uses the default 404 page containing the breakout game widget. Use the default 404 page property [glide.service_portal.default_404_page] to configure the default error page.

Create a page before adding it as the default error page.

1. Navigate to Service Portal Properties.
2. In the Default 404 page for Service Portals, type the page ID found in the ID field of the page form.

Add SEO information to Service Portal pages

Improve the searchability of Service Portal pages by adding meta tags and descriptive titles.

You can add SEO information to Service Portal pages by:

• Associating public pages with meta tags to optimize search from external search engines.
• Using record data loaded in a page to dynamically generate descriptive page titles and meta tags.

Dynamic meta tags and titles

Some pages in the Service Portal load record data based on a URL parameter. You can add meta tags and page titles that vary depending on the record loaded in the page.

Using Service Catalog as an example, the following URL includes a sys_id parameter in addition to the page ID. Different content is loaded depending on the value of the sys_id parameter.

https://<yourInstance>.service-now.com/sp?id=sc_cat_item&sys_id=060f3afa3731300054b6a3549dbe5d3e

If a page loads dynamic content, you can:

• Add meta tags to the page.
• Add meta tags that vary based on content.
• Add variables that generate descriptive page titles based on content.
• Add dynamic content to a page title.
• Create targeted page titles for use with a screen reader.

For example, you can set a Service Catalog page to generate a dynamic title and meta tag based on record data associated with the sys_id in the URL parameter.
Add meta tags to a public page

Improve the searchability of Service Portal pages by adding meta tags. You can add the meta name and description attributes to a page, define the robots attribute, or create dynamic meta tags for pages that load record data based on a URL parameter.

Role required: admin or sp_admin

1. Navigate to Service Portal Pages.
2. Open a page.
3. Check that Public is selected. Pages that are not public are not indexed by external search engines.
4. Click the Meta tags related list tab.
5. Click New to create a new meta tag.
6. Complete the form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Page</td>
<td>Page to apply the meta tag to.</td>
</tr>
<tr>
<td>Application</td>
<td>Application scope of the page. This value is read-only.</td>
</tr>
</tbody>
</table>
| Name      | The HTML meta name attribute.  
To define the meta robots attribute, add ROBOTS. |
| Content   | The HTML meta description attribute.  
If ROBOTS is defined in the Name field, you can add one of the following content values:  
• INDEX, FOLLOW: The search engine shows the page in search results and trusts any links in the page. This is the default value.  
• NOINDEX, FOLLOW: The search engine does not show the page in search results, but trusts any links in the page.  
• INDEX, NOFOLLOW: The search engine shows the page in the search results, but does not trust links in the page.  
• NOINDEX, NOFOLLOW: The search engine does not show the page in search results and does not trust links in the page.  
Alternatively, you can pass a variable into this field based on record data. For example, you can define a %description variable in this field, and create a content variable to populate the content tag with record data. |

7. Click Submit.
The meta information is added to the page header. For example:

```
<meta name="description" content="Order something from the Service Catalog">
```

8. Create a content variable to populate the content tag with record data.

If the page loads record data based on one or more URL parameters, you can add meta tags generated from the record data.

a) Open a meta tag record and check that the Content field contains a variable, or add a variable.

Depending on the available URL parameters and the meta tag you would like to define, you can add the following types of values:

<table>
<thead>
<tr>
<th>Value types</th>
<th>Description</th>
<th>Example value</th>
</tr>
</thead>
<tbody>
<tr>
<td>One URL parameter variable</td>
<td>Populates the content tag with the value defined in the associated content variables record.</td>
<td>%description</td>
</tr>
<tr>
<td>More than one URL parameter variable</td>
<td>Populates the content tag with the values defined in the associated content variables records.</td>
<td>%description %price</td>
</tr>
<tr>
<td>Static value and a URL parameter variable</td>
<td>Populates the content tag with a static value and the associated content variables record.</td>
<td>Catalog item: %description</td>
</tr>
</tbody>
</table>

b) In the Content variables related list, click New.

The Content variables related list is only available after saving the meta tag record.

c) Complete the form.

Associate a field with a URL query parameter. When the value of the query parameter is used to display content, a field from the same record is used to generate the content tag. You can define the field to generate the content tag through the Table field field.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The variable to store the value. Must begin with % and cannot contain spaces. This value must match one of the variables defined in the Content field in the Meta tag record.</td>
</tr>
<tr>
<td>Application</td>
<td>Application scope of the page. This value is read-only.</td>
</tr>
<tr>
<td>Metatag</td>
<td>The meta tag to apply the dynamic variable to.</td>
</tr>
<tr>
<td>URL query parameter</td>
<td>The URL parameter that determines the record to display.</td>
</tr>
<tr>
<td>Table</td>
<td>The source table of the URL query parameter record.</td>
</tr>
<tr>
<td>Table field</td>
<td>Select a field from the table defined in the Table field. This field is used to generate the value of the content tag.</td>
</tr>
</tbody>
</table>

If more than one content variables match a variable defined in the Content field of the meta tag record, the record with the earliest Created date is used.

d) Click Submit.
The content tag loads record data. For example:

```html
<meta name="description" content="Apple iPad 3">
```

Add dynamic titles to a page

Create variables to generate descriptive titles depending on the content loaded into a page.

Role required: admin

1. Navigate to Service Portal Pages.
2. Open a page.
3. Add one or more variables to the Dynamic page title field.
   Depending on the available URL parameters and the dynamic title you would like to define, you can add the following types of values:
<table>
<thead>
<tr>
<th>Value types</th>
<th>Description</th>
<th>Example value</th>
</tr>
</thead>
<tbody>
<tr>
<td>One URL parameter variable</td>
<td>Generates a page title using the associated record of one URL parameter.</td>
<td>%question</td>
</tr>
<tr>
<td>More than one URL parameter variable</td>
<td>Generates a page title using the associated records of multiple URL parameters.</td>
<td>%question %author</td>
</tr>
<tr>
<td>Static value and a URL parameter variable</td>
<td>Generates a page title using a static value and the associated record of a URL parameter.</td>
<td>Q&amp;A: %question</td>
</tr>
</tbody>
</table>

4. Click the Dynamic page title variables related list tab.
5. Click New to create a new variable.
6. Complete the form.
   Associate a field with a URL query parameter. When the value of the query parameter is used to display content, a field from the same record is used to generate the title. You can define the field to generate the title through the Table field.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The variable to store the value. Must begin with % and cannot contain spaces. This value must match one of the variables defined in the Dynamic page title field.</td>
</tr>
<tr>
<td>Application</td>
<td>Application scope of the page. This value is read-only.</td>
</tr>
<tr>
<td>Page</td>
<td>The page to apply the dynamic variable to.</td>
</tr>
<tr>
<td>URL query parameter</td>
<td>The URL parameter that determines the record to display.</td>
</tr>
<tr>
<td>Table</td>
<td>The source table of the URL query parameter record.</td>
</tr>
<tr>
<td>Table field</td>
<td>Select a field from the table defined in the Table field. This field is used to generate the dynamic page title.</td>
</tr>
</tbody>
</table>

If more than one dynamic page variables match a variable defined in the Dynamic page title field, the record with the earliest Created date is used.
In this example, the value of the Question field in the Social Q&A Question table populates the page title. The %question variable must also be defined in the Dynamic page title field in the page record.

7. Click Submit.

When the page loads, the record defined in the URL query parameter displays. The field defined in Table field determines the title of the page.

### Page navigation by URL

You can navigate to a portal or a page using the URL.

A Service Portal URL contains the following elements.

```
https://<base instance url>/<sp url suffix>?id=<page id>&<page parameters>
```

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Instance URL</td>
<td>Unique, secure web address for each instance. The default format is: https://&lt;instance name&gt;.service-now.com.</td>
</tr>
<tr>
<td>sp url suffix</td>
<td>Suffix established for the Service Portal. For example /sp.</td>
</tr>
<tr>
<td>id</td>
<td>The id of the Page to navigate to within the portal frame. For example, ? id=index.</td>
</tr>
</tbody>
</table>
London

ServiceNow

Now Platform Capabilities

Element

Description

page parameters

Some pages require additional parameters to look up a record (table,
sys_id). Find the $sp.getParameter calls in a widget server script to see
what parameters a widget uses. For more detail on this method see
GlideSPScriptable

For example, https://<instance name>.service-now.com/sp?id=kb_view2
Note: If you use article versioning with the Knowledge Management - Service Portal
(com.snc.knowledge_serviceportal) plugin enabled, you must add the article version
number to the URL to open a knowledge article in the base system or knowledge portals.
For example, instead of accessing an article using the URL https://<instance name>/sp?
id=kb_article&sys_id=KB0000005, you must include the article version number: https://<instance
name>/sp?id=kb_article&sys_id=KB0000005%20V1.0. To learn more, see Article versioning on
page 1451.

Referencing a page id
Widgets and widget instance options reference Service Portal pages using the page id. For example, a link
to the sc_home page within a widget HTML template might appear as:
<div><a href="?id=sc_home">${Order something...}</a></div>

Redirect a reference to a page ID
Multiple widgets in the Service Portal may link to a single page using a hard-coded page ID. If you want
to replace the page, all widgets that reference the page must be updated with the new page ID. Instead of
cloning and updating each widget with the new page ID, you can create a single record that automatically
redirects all references to the original page to point to the new page. This way, you can replace a page
without locating and replacing all references to the page ID.
Role required: sp_admin
To redirect all references to a page, create a record in the Page Route Maps table [sp_page_route_map].
This table enables you to redirect a reference to a page without cloning base system widgets.
Creating a record in the Page Route Maps table only redirects references to a page. It does not redirect
navigation to a page ID within a URL.
1.
2.

Navigate to Service Portal Page Route Maps .
Click New.

3.

Complete the form.
Field

Description

Short Description

Optional short description to describe the redirect.

Service Portal(s)

Portals that apply the redirect. If no Service Portal is selected,
the redirect applies to all Service Portals in the instance.

Route from

Original page you are redirecting from.

Route to

Page you are redirecting to.

Active

Whether the Page Route Map record is active. The redirect is
only applied when the record is active.

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2684


<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order</td>
<td>Priority of the Page Route Map record. If more than one active record has the same value in the Route from field, the record with the lowest order applies. Records are applied from lowest to highest. If multiple records have a matching order, the oldest record is honored.</td>
</tr>
</tbody>
</table>

4. Click Update.

All references to the page listed in the Route from field redirect to the page in the Route to field.

Include font icons on a page

Include font icons on a page so that all the widgets on the page have access to the font-icon set.

1. In the platform UI, navigate to Service Portal Pages and click the page you want to add font icons to.
2. Attach the font-icon file to the page record.
3. In the Page Specific CSS field for the page, add the CSS for the font-icon definition. Use the sys_id of the attachment as the src in the CSS.
Result

You can select an icon from the icon set for any widget on this page. For example, in the HTML widget you can use the source code option to use an icon.
Source code

```html
<p style="text-align: center;"><em class="material-icons">flight_land</em></p>
```
Service Portal widgets

Widgets are what define the content in your portal. You can use the base system widgets provided with Service Portal, clone and modify widgets, or develop custom widgets to fit your own needs.

Out of box widgets are read-only so you can benefit from future updates, which means you can't update their code. If you need to make major changes, clone the widget and give it another name and ID.

Widget library

Widgets included with Service Portal can be customized to suit your own needs or as a basic code sample for you to refer to as you are building your own widgets.

Due to the ever-changing number of widgets that exist at any given time in Service Portal, this is not a definitive list. More widget descriptions will be added as they become available.

Depending on your configuration, widgets that do not contain any information do not appear in your Service Portal page.

To view the instance options for a widget, use the widget context menu.

<table>
<thead>
<tr>
<th>Example widgets</th>
<th>Service Catalog widgets</th>
<th>Knowledge Management widgets</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Announcements widget on page 2690</td>
<td>• SP Variable Editor widget on page 2759</td>
<td>• KB also in Category widget on page 2733</td>
</tr>
<tr>
<td>• Approvals widget on page 2691</td>
<td>• Catalog Content widget on page 2760</td>
<td>• KB Article Comments widget on page 2734</td>
</tr>
<tr>
<td>• Approval Info widget on page 2692</td>
<td>• Request Fields widget on page 2761</td>
<td>• KB Article Page widget on page 2735</td>
</tr>
<tr>
<td>• Approval Record widget on page 2693</td>
<td>• Requested Items widget on page 2762</td>
<td>• KB Categories widget on page 2738</td>
</tr>
<tr>
<td>• Breadcrumbs widget on page 2694</td>
<td>• SC Catalog Item widget on page 2765</td>
<td>• KB Category Page widget on page 2740</td>
</tr>
<tr>
<td>• Breakout Game widget on page 2694</td>
<td>• SC Categories widget on page 2767</td>
<td>• KB Most Viewed widget on page 2742</td>
</tr>
<tr>
<td>• Calculator widget on page 2695</td>
<td>• SC Category Page widget on page 2771</td>
<td>• KB News widget on page 2743</td>
</tr>
<tr>
<td>• Carousel widget on page 2695</td>
<td>• SC Order Guide widget on page 2771</td>
<td>• KB Search widget on page 2745</td>
</tr>
<tr>
<td>• Cool Clock widget on page 2699</td>
<td>• SC Popular Items widget on page 2772</td>
<td>• KB Top Rated widget on page 2746</td>
</tr>
<tr>
<td>• Header menu widget on page 2705</td>
<td>• SC Wish List Cart widget on page 2773</td>
<td>• KB View widget on page 2747</td>
</tr>
<tr>
<td>• Hello World widgets on page 2705</td>
<td>• SC Save Bundles widget on page 2777</td>
<td>• KB View 2 widget on page 2749</td>
</tr>
<tr>
<td>• HTML widget on page 2708</td>
<td>• SC Saved Carts widget on page 2779</td>
<td>• My Favorite Tags widget on page 2749</td>
</tr>
<tr>
<td>• Icon Link widget on page 2709</td>
<td>• SC Shopping Cart widget on page 2781</td>
<td>• Popular Questions widget on page 2750</td>
</tr>
<tr>
<td>• Icon menu list widget on page 2710</td>
<td>• SC Scroll to top widget on page 2788</td>
<td>• SQANDA Create Question widget on page 2751</td>
</tr>
<tr>
<td>• Language Switch widget on page 2712</td>
<td></td>
<td>• SQANDA Question widget on page 2752</td>
</tr>
<tr>
<td>• Link button widget on page 2712</td>
<td></td>
<td>• SQANDA Related Question widget on page 2754</td>
</tr>
</tbody>
</table>
• Login widget on page 2713
• My Requests widget on page 2713
• Organization Chart widget on page 2715
• Sample Footer widget on page 2719
• Ticket Attachments widget on page 2719
• Ticket Conversations widget on page 2720
• Ticket Location widget on page 2721
• User Profile widget on page 2722
• Weather widget on page 2723

Service Status widgets
• Business Service Status widget on page 2796
• Current Status widget on page 2798
• Planned Maintenance widget on page 2799
• Service History widget on page 2800
• Service Status widget on page 2801
• Service Status Legend widget on page 2802
• Service Status Subscription widget on page 2802

Service Portal configuration widgets
• Service Portal Config Overview widget on page 2790
• Portal config widget on page 2792
• SP Page Map widget on page 2794
• SP Portal Map widget on page 2794
• Theme Preview widget on page 2794
• Widget Edit Panel widget on page 2796

List and form widgets
• Simple List widget on page 2716
• Data table from instance definition widget on page 2700
• Data Table from URL definition widget on page 2702
• Form widget on page 2704

Search widgets
• Home Page Search widget on page 2727
• Typeahead Search widget on page 2731
• Contextual Search widget on page 2724
• Legacy: Search Page widget on page 2729

Example widgets
All widgets in Service Portal can be used as example code for how scripts are used in a widget. However, several out-of-box widgets have been included expressly for this purpose.

Use the example widgets to see how to use HTML, CSS, or client and server scripts in Service Portal. You can also clone and extend each widget to suit your needs.
**Announcements widget**

Users can view all active announcements.

![Announcements widget](image)

**Instance options**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
</table>
| Type                 | Select the type of announcements to display. Announcement types can be selected in the announcement record. Choices include:  
  • Banner  
  • Widget  
  If a type is not defined, the widget instance displays all active announcements. |
| Title                | Widget header title.                                                                                                                                                                                         |
| Glyph                | Glyph displayed to the left of the title.                                                                                                                                                                    |
| Use Display Style    | If selected, each announcement displays according to the style defined in the announcement record. Before selecting this option, consider how the widget will display if multiple announcements in the widget use different styles. |
| Paginate             | Paginates multiple announcements.                                                                                                                                                                             |
| Max Records          | Number of announcements displayed per page.                                                                                                                                                                  |
| View All Page        | Click target for View all link. The View all link only displays when:  
  • There are more announcements than can be displayed on a single page.  
    The Max Records field defines the number of records displayed per page.  
  • A view all page is defined. |
### Approvals widget

Users can approve or reject items directly within Service Portal.

![My Approvals](image)

**REQ0010001 - Dell Precision 690**
Requestor ITIL User
Price $1,875.00

**Options**

- **Reject**
- **Approve**

*Figure 519: Approvals widget*

You can enable e-signature for the approvals widget to require re-authentication for your users. For more information on enabling e-signature, see [Enable e-signature for Service Portal](#) on page 2892.

### Instance options

Use the instance options to change the appearance of the approvals widget.

**Table 1121: Approvals widget instance options**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bootstrap color</td>
<td>Color scheme for the widget. The default colors are defined by the portal theme, but if you want the instance to have a specific color, select the option from the list.</td>
</tr>
<tr>
<td>Glyph</td>
<td>Add an icon to display beside the widget name.</td>
</tr>
<tr>
<td>Buttons stacked side by side</td>
<td>If this check box is selected, the Approve and Reject buttons appear horizontally beside each other. If this check box is cleared, the Approve and Reject buttons appear stacked vertically.</td>
</tr>
</tbody>
</table>
Approval Info widget

The Approval Info widget works in tandem with the Approval widget to display details about the approval request.

![Approval Info widget](image)

Figure 520: Approval Info widget

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max number of elements shown in the list</td>
<td>Limit the number of approvals users see on a page. The default number is 10. Only enter numbers greater than 0.</td>
</tr>
<tr>
<td>Who can view instances/who cannot view instances</td>
<td>Control who can or cannot view a widget instance with user criteria. User criteria must be enabled for this option to appear.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bootstrap color</td>
<td>Color scheme for the widget. The default colors are defined by the portal theme, but if you want the instance to have a specific color, select the option from the list.</td>
</tr>
</tbody>
</table>
Approval Record widget
The Approval Record widget shows the full record for an approval including the activity stream.

Figure 521: Approval Record widget

Instance options
The approval record widget does not include instance options.
Breadcrumbs widget
The breadcrumbs widget allows users to easily navigate around a portal.

Figure 522: Breadcrumbs widget

Instance options

The breadcrumbs widget does not have instance options. It displays information based on where a page is located in a portal.

Breakout Game widget
Add a fun, interactive 404 page to pages that do not exist using the Breakout Game widget.

Figure 523: Breakout Game widget
Instance options

The Breakout Game does not have instance option. You can use it as an example of how to use the Link Function as part of an Angular Directive.

Calculator widget

The calculator widget does simple calculations.

Use the calculator widget as an example of how to pass data between the client and server.

![Calculator widget](image)

Figure 524: Calculator widget

Instance options

The calculator widget does not include instance options.

Carousel widget

Showcase specific items in your catalog using a scrolling list of images in the carousel widget.

Use the carousel widget to showcase items on your portal page. For example, display items available in a service catalog at the top of the service catalog page.
Figure 525: Carousel widget

Add slides to the carousel widget
Use the related lists for an instance of the carousel widget to add images for the carousel widget to scroll through.

Role required: Admin or sp_admin

1. Navigate to Service Portal Widgets Carousel.
2. Open an instance of the Carousel widget.
3. From the instance of carousel form, under Related Lists, click Carousel Slides.
4. Click New and complete the form.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the carousel slide. Use the name to differentiate the slide from other slide records.</td>
</tr>
<tr>
<td>Order</td>
<td>Where the slide appears in the list of slides</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>HREF/URL</td>
<td>Link to the item in the slide. For example, for a slide with a catalog item, link to page for the catalog item using the HREF <code>?id=&lt;page name&gt;&amp;sys_id=&lt;sys_id for item&gt;</code>. For more information on linking to a page within a portal, see <em>Page navigation by URL</em> on page 2683. You can also link to other sites using the URL.</td>
</tr>
<tr>
<td>Background</td>
<td>Upload an image for the slides. Carousel images should be 1022x300 pixels.</td>
</tr>
<tr>
<td>Application</td>
<td>Automatically populated with the name of the application the portal falls under.</td>
</tr>
<tr>
<td>Carousel</td>
<td>Name of the instance of the carousel widget you are adding the slide to. This field is not automatically populated and you cannot select an instance of the carousel widget if it does not have a name.</td>
</tr>
</tbody>
</table>

Repeat this step for as many slides as you want to appear in the carousel widget.

*Change Password widget*

Users can change their passwords using the Change Password widget.

---

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Figure 526: Change Password widget

**Instance Options**

The Change Password widget does not have instance options.

*Cool Clock widget*

Show different times around the world using the Cool Clock widget.

Cool clocks demonstrates how to use instance options in a widgets. The time zone is loaded using an instance option. If you do not select a time zone, the widget uses a default time zone.
Figure 527: Cool Clock widget

Instance options

Table 1123: Cool clock widget instance options

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>Name of the clock, for example New York, NY.</td>
</tr>
<tr>
<td></td>
<td>The name appears below the clock so it helps to use a name related to the time zone.</td>
</tr>
<tr>
<td>Timezone</td>
<td>The location from which the time is displayed.</td>
</tr>
<tr>
<td></td>
<td>Use the local full name, for example, America/New York, instead of the abbreviated time zone.</td>
</tr>
<tr>
<td></td>
<td>Using the full name allows time zones to stay consistent with daylight savings time.</td>
</tr>
<tr>
<td></td>
<td>The default value is America/Los Angeles.</td>
</tr>
<tr>
<td>Second hand color</td>
<td>Color of the second hand using the hex code, RGB, or color name. The default value is red.</td>
</tr>
</tbody>
</table>

Data table from instance definition widget

Display a filtered list on your portal using the data table from instance definition widget.

After you add the data table from instance definition widget to a page, use the instance options to configure the appearance of the table.
### Incidents

*All > Active = true, priority=1 critical*

<table>
<thead>
<tr>
<th>Number</th>
<th>Category</th>
<th>Short description</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>INC0000001</td>
<td>Network</td>
<td>Can't read email</td>
<td>1 - Critical</td>
</tr>
<tr>
<td>INC0000004</td>
<td>Inquiry / Help</td>
<td>Forgot email password</td>
<td>1 - Critical</td>
</tr>
<tr>
<td>INC0000005</td>
<td>Hardware</td>
<td>CPU load high for over 10 minutes</td>
<td>1 - Critical</td>
</tr>
<tr>
<td>INC0000006</td>
<td>Software</td>
<td>Hang when trying to print VISIO document</td>
<td>1 - Critical</td>
</tr>
<tr>
<td>INC0000008</td>
<td>Inquiry / Help</td>
<td>Printer in my office is out of toner</td>
<td>1 - Critical</td>
</tr>
</tbody>
</table>

Rows 1 - 5 of 22

---

**Figure 528: Data table from instance definition widget**

**Instance options**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>The title of the widget. If you leave this field empty the name of the table displays as the widget name.</td>
</tr>
<tr>
<td>Table</td>
<td>The table that the widget displays records from.</td>
</tr>
<tr>
<td>Filter</td>
<td>Text field from the condition builder that you can use to limit the items returned in the table. To create a filter, use the context menu to open the widget instance in the platform. Then use the condition builder to create a filter.</td>
</tr>
<tr>
<td>Maximum entries</td>
<td>Limits the number of items displayed in the table. If there are more entries than allowed in the table, users can scroll to the next page.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Glyph</td>
<td>Icon that displays beside the widget title</td>
</tr>
<tr>
<td>Fields</td>
<td>Columns to display in the table.</td>
</tr>
<tr>
<td>Bootstrap color</td>
<td>Color scheme for the widget. The default colors are defined by the portal theme, but if you want the instance to have a specific color, select the option from the list.</td>
</tr>
<tr>
<td>Link to this page</td>
<td>Direct users to a specific page when they click a record. By default, clicking an entry in the table opens that entry in a form.</td>
</tr>
</tbody>
</table>

*Data Table from URL definition widget*

The Data Table from URL definition widget displays the table you select from the list.

Figure 529: Data Table from URL definition widget

*Instance options*

Complete the instance options to define the table.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>The title of the widget. Select the Use Instance Title check box to use this title instead of the name of the table.</td>
</tr>
<tr>
<td>Glyph</td>
<td>Icon that displays beside the widget title</td>
</tr>
<tr>
<td>Bootstrap color</td>
<td>Color scheme for the widget. The default colors are defined by the portal theme, but if you want the instance to have a specific color, select the option from the list.</td>
</tr>
</tbody>
</table>
### Field Description

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Link to this page</td>
<td>Direct users to a specific page when they click a record. By default, clicking an entry in the table opens that entry in a form.</td>
</tr>
<tr>
<td>Fields</td>
<td>Columns to display in the table. For example, short description or priority.</td>
</tr>
<tr>
<td>Use Instance Title</td>
<td>Select to use the title in the Title field instead of the table title.</td>
</tr>
<tr>
<td>Enable Filter</td>
<td>Select this check box to allow users to create their own filter for the table</td>
</tr>
</tbody>
</table>

If Enable filter is enabled in the instance options, users can add custom conditions to filter the results.

![Figure 530: Data Table URL with condition builder](image)

For more information on using the condition builder, see *Create a filter in List v3*.

**Note:** The condition builder is only available in the desktop view.
**Form widget**
The form widget is a platform form within the Service Portal UI with a few differences.

![Form widget example](image)

**Figure 531: Form widget**

**URL Parameters**

The form widget accepts the following parameters within the URL
Table 1125: Form widget URL parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sys_id or sl_sys_id</td>
<td>The sys_id for the record to be displayed</td>
</tr>
<tr>
<td>table, sl_table, or t</td>
<td>The table for the record to be displayed</td>
</tr>
<tr>
<td>view or v</td>
<td>The view used to display the record</td>
</tr>
</tbody>
</table>

In the following example, the URL would display an incident with a sys_id of 1c741bd70b2322007518478d83673af3 in the portal view.

https://example.service-now.com/sp?id=form&table=incident&sys_id=1c741bd70b2322007518478d83673af3&view=portal

Scripting

Not all client scripts are supported in the Service Portal. To understand how client scripts interact with forms in the Service Portal, see Service Portal and client scripts on page 2635 and Supported client script types and APIs on page 2636.

Header menu widget

The Header Menu widget controls which options appear in the page header. Unlike other widgets in Service Portal, the header menu widget is not something you drag onto a page. Instead you configure the header menu by associating the header menu with a portal. For more information on configuring a header menu, see Configure a portal header menu on page 2660.

Figure 532: Header Menu widget

Instance options

The header menu widget does not include instance options.

Hello World widgets

The Hello World widgets are included with Service Portal as examples of how to use and create widgets. All three Hello World widgets display the same way. The real difference between them is in their underlying code base. Each version of the widget uses a different method of using the server and client script.

To view the Hello World widgets, navigate to Service Portal Service Portal Configuration then click Widget Editor. In the Widget Editor, click Check out the Hello World Example.
Figure 533: Hello World 1

Hello world 1 displays how the HTML template and the client script communicate. For more information on using the client script in Service Portal, see Widget developer guide on page 2807.

Use the widget list to switch to Hello World 2 or 3.
Figure 534: Hello World 2

Hello World 2 includes an example of how the server script can be used as well.
Figure 535: Hello World 3

For more information on Service Portal APIs, see the GlideSPSriptable API.

**HTML widget**
Use the HTML widget to directly inject HTML, text, lists, or content in general into a page.

Because the HTML widget can contain content of any kind, any example may just appear as regular text. For example, the HTML widget appears as a box of text on the 404 page.
Figure 536: HTML widget

Instance options

Table 1126: HTML widget instance options

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>Name for the HTML text. Users do not see this information.</td>
</tr>
<tr>
<td>HTML</td>
<td>Text box for the HTML. Use the toolbar like most word processing tool bars. For more information on using the toolbar, see Formatting icons for the HTML field editors.</td>
</tr>
</tbody>
</table>

Icon Link widget

Link to any other item.

Configure Icon Link widgets to link to a specific URL, page within the portal, or a specific category in the knowledge base or the service catalog.

Order Something

Browse the catalog for services and items you need

Figure 537: Icon Link widget
### Instance options

**Table 1127: Instance options fields**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>Name of the icon link. Choose something that defines what the widget is linking to.</td>
</tr>
<tr>
<td>Glyph</td>
<td>Icon for the widget.</td>
</tr>
<tr>
<td>Bootstrap class name</td>
<td>Use concurrently with page or theme level CSS.</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Defines what the widget links to. The fields that appear on the form vary depending on which option you select. Choose from:</td>
</tr>
<tr>
<td></td>
<td>• Page: Another page in the Service Portal</td>
</tr>
<tr>
<td></td>
<td>• URL: Link to an external website.</td>
</tr>
<tr>
<td></td>
<td>• Catalog category: Link to a specific catalog category within the service catalog.</td>
</tr>
<tr>
<td></td>
<td>• Catalog item: Link to a specific catalog item.</td>
</tr>
<tr>
<td></td>
<td>• KB topic: Link to a KB topic page.</td>
</tr>
<tr>
<td></td>
<td>• KB article: Link to a KB article by number.</td>
</tr>
<tr>
<td></td>
<td>• KB category: Link to a specific KB category within the knowledge base.</td>
</tr>
<tr>
<td>Page</td>
<td>Page within the portal that you want to link to. This field varies depending on the Type you choose.</td>
</tr>
<tr>
<td>Bootstrap color</td>
<td>Color scheme for the widget. The default colors are defined by the portal theme, but if you want the instance to have a specific color, select the option from the list.</td>
</tr>
<tr>
<td>Template</td>
<td>The appearance of the link icon widget. Choose from:</td>
</tr>
<tr>
<td></td>
<td>• Top icon</td>
</tr>
<tr>
<td></td>
<td>• Circle icon</td>
</tr>
<tr>
<td></td>
<td>• Color box</td>
</tr>
</tbody>
</table>

**Icon menu list widget**

A simple list with a glyph icon next to each link.

Configure the icon information using the Menu Items related list.
1. From the instance options for the icon menu list widget, under Related Lists, click Menu Items.
2. Click New.
3. Use the fields on the New Menu Items form to configure the icons for the icon menu list widget.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Label</td>
<td>Name or description of the icon</td>
</tr>
<tr>
<td>Parent Menu</td>
<td>The name of the menu that the icon appears in. This automatically populates with the name of the icon menu list widget that you created but you have the option to switch it to another menu.</td>
</tr>
<tr>
<td>Order</td>
<td>The order in which the icons appear in the icon menu list widget.</td>
</tr>
<tr>
<td>Parent menu Item</td>
<td>Nest menu items within a parent menu.</td>
</tr>
<tr>
<td>Page</td>
<td>The page within Service Portal that the icon links to. Select Page from the Type list to enable this option.</td>
</tr>
<tr>
<td>Type</td>
<td>Select the type of link you want the icon to have. You can link to pages within Service Portal, external URLs, KB articles, Service Catalog, or lists. Different fields will appear on the form depending on the option you select from the list.</td>
</tr>
<tr>
<td>Condition</td>
<td>Determines what conditions are required for menu items to show in the header. For more information on what conditions to use in the Condition field, see Create a UI action.</td>
</tr>
<tr>
<td>Glyph</td>
<td>Icon that you want to display in the icon menu list widget.</td>
</tr>
</tbody>
</table>
**Language Switch widget**
Add the Language Switch widget to a landing or homepage to allow your users to change the language of the page.

![Language Switch widget](image)

Figure 539: Language Switch widget

**Instance options**

The Language Switch widget does not include any instance options.

**Link button widget**
The Link Button widget is a button you can nest in any other widget that links to another destination.

![Link Button widget](image)

Figure 540: Link Button widget

**Instance options**

Table 1129: Instance option fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bootstrap color</td>
<td>Color scheme for the widget. The default colors are defined by the portal theme, but if you want the instance to have a specific color, select the option from the list.</td>
</tr>
<tr>
<td>Link for button</td>
<td>Page that the button links to. Use $id=&lt;page_name&gt; to link to another page in the portal.</td>
</tr>
</tbody>
</table>
**Login widget**
The login widget controls user access to your site.

![Login widget](image)

**Figure 541: Login widget**

**Instance options**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Show panel</td>
<td>Show or hide the panel that appears behind the login widget. The panel helps the widget stand out from the page background rather than blending in.</td>
</tr>
</tbody>
</table>

**My Requests widget**
The My Requests widget stores all of your open requests in one place.

The list is updated in real time so you can see your requests getting processed. The widget pulls open request information from the `sc_request` table.
Figure 542: My Requests widget

**Instance options**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>Requests</td>
</tr>
<tr>
<td>Bootstrap color</td>
<td>Default</td>
</tr>
<tr>
<td>Maximum entries</td>
<td></td>
</tr>
</tbody>
</table>

Figure 543: My Requests widget instance options

Table 1131: Instance options fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>Name of the widget. The name you enter here appears in the header for the widget.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Bootstrap color</td>
<td>Color scheme for the widget. The default colors are defined by the portal theme, but if you want the instance to have a specific color, select the option from the list.</td>
</tr>
<tr>
<td>Maximum entries</td>
<td>The maximum number of entries allowed to appear in the widget.</td>
</tr>
</tbody>
</table>

**Organization Chart widget**

The Organization Chart widget shows employees in a tree structure relative to their manager.

The Organization Chart widget gets data from the Users table [sys_users].
The Simple List widget can be used to display any list in the system within Service Portal.

Figure 544: Organization Chart widget

Simple List widget
The Simple List widget can be used to display any list in the system within Service Portal.
<table>
<thead>
<tr>
<th>My Open Incidents</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>InsideSales NeuralView Instance relocation from US datacenter to Hongkong dat...</strong></td>
</tr>
<tr>
<td>INC0006789 • a day</td>
</tr>
<tr>
<td><strong>Results not as per expectation after performing the documented steps in Oracl...</strong></td>
</tr>
<tr>
<td>INC0006911 • a day</td>
</tr>
<tr>
<td><strong>Performance degrade observed in Oracle Planning and Budgeting</strong></td>
</tr>
<tr>
<td>INC0006890 • a day</td>
</tr>
<tr>
<td><strong>Network response time is poor</strong></td>
</tr>
<tr>
<td>INC0006800 • a day</td>
</tr>
<tr>
<td><strong>Performance degrade observed in Eloqua Marketing Measurement</strong></td>
</tr>
<tr>
<td>INC0006790 • a day</td>
</tr>
<tr>
<td><strong>Fidelity Stock Plan Services upgrade to the latest version</strong></td>
</tr>
<tr>
<td>INC0006797 • a day</td>
</tr>
</tbody>
</table>

*Figure 545: Simple List widget*
## Instance options

### Table 1132: Instance options fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table</td>
<td>The platform table that the simple list is formed from.</td>
</tr>
<tr>
<td>Display field</td>
<td>Main field that displays as the &quot;title&quot; of the list item.</td>
</tr>
<tr>
<td>Glyph</td>
<td>Icon that displays next to the widget name in the header</td>
</tr>
<tr>
<td>Filter</td>
<td>Conditions that are applied to the list. To edit the filter, in the widget instance options context menu, select Open in platform. Use the Table &amp; Filter tab to apply conditions to the simple list. For more information, see <a href="#">Create a filter in List v3</a>.</td>
</tr>
<tr>
<td>Link to this page</td>
<td>Portal page to link to from a list item.</td>
</tr>
<tr>
<td>Bootstrap color</td>
<td>Color scheme for the widget. The default colors are defined by the portal theme, but if you want the instance to have a specific color, select the option from the list.</td>
</tr>
<tr>
<td>Bootstrap size</td>
<td>Size of the widget</td>
</tr>
<tr>
<td>Maximum entries</td>
<td>Maximum allowed number of entries that appear in the list at one time.</td>
</tr>
<tr>
<td>Show even when empty</td>
<td>Widgets are designed to hide on a page when no results meet the criteria. Select this option to make the simple list widget display on a page even when empty.</td>
</tr>
<tr>
<td>List body height</td>
<td>Actual length of the widget in pixels or EMs. A long list with a small body height includes a scroll bar option.</td>
</tr>
<tr>
<td>Image field</td>
<td>Displays an image in the list. Select a field type that includes an image. For example, Photo.</td>
</tr>
<tr>
<td>Secondary fields</td>
<td>Fields from the list item that display in addition to the main display field.</td>
</tr>
<tr>
<td>Rounded images</td>
<td>Makes any images selected in the Image field round in the list.</td>
</tr>
<tr>
<td>List page</td>
<td>The page that opens when a user selects View all in the widget footer. Select a page that correlates with the items that display in the list.</td>
</tr>
<tr>
<td>Hide footer</td>
<td>Show or hide the widget footer</td>
</tr>
</tbody>
</table>
Sample Footer widget

The Sample Footer widget is an example of a footer you can use in your portal.

Unlike other widgets in Service Portal, you add a footer to your portal by configuring it in the Theme form. For more information on adding a footer to a portal, see Add a header or footer to a portal on page 2661.

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Figure 546: Sample Footer widget

Instance options

The Sample footer widget does not include instance options.

Ticket Attachments widget

Use the attachment widget to attach items to tickets.

Attachments should be less than 24MB. You can drag files into the Attachments widget to add them to a record.

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Figure 547: Ticket Attachments widget

Instance options

Table 1133: Ticket attachments widget instance options

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Record ID</td>
<td>The ID number of the record for the attachment.</td>
</tr>
<tr>
<td>Record table</td>
<td>Limit the records users can add an attachment to by adding a table to the attachment widget. Users can then only add attachments if they are in a record for that table.</td>
</tr>
</tbody>
</table>
Ticket Conversations widget

Record of ticket items. Users can use this widget to communicate back and forth with the fulfiller and the receiver.

Journal entries are presented in chronological order, with the oldest entries appearing at the bottom of the widget. Entries made by the user that created the record appear on the right side of the center divider. Entries made by other users appear to the left.

The Ticket Conversations widget is intended only for tables that extend task.

Limit the number of journal entries that appears in the ticket conversation widget using the glide.service_portal.stream_entry_limit system property. The default number is 100. Change the number by navigating to Service Portal Properties, and enter the new number in the Maximum number of stream entries displayed in Service Portal field.

Figure 548: Ticket Conversations widget
Instance options

Table 1134: Instance options fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use dynamic placeholder</td>
<td>Use a placeholder for journal fields. The default value is false.</td>
</tr>
<tr>
<td>No readable journal field message</td>
<td>The message that displays when there are no readable journal fields. Forms that have added journal fields may not display in the Ticket Conversation widget.</td>
</tr>
</tbody>
</table>

*Ticket Location widget*
Share you location in a ticket.
Instance options

The Ticket Location widget does not include any instance options.

User Profile widget
Display user profile information.

Users can use the User Preferences section to enable accessibility in a portal.
Figure 550: User Profile widget

Instance options

The User Profile widget does not include instance options.

Weather widget
The Weather widget shows an example of how the server script interprets data from a source outside of the system.
Figure 551: Weather widget

**Instance options**

The Weather widget does not include instance options.

**Search widgets**

Several search widgets are provided with Service Portal.

You can configure search in Service Portal using any of the search widgets.

*Contextual Search widget*

Contextual Search is an embedded widget that can be added to a record producer.

By default, the widget is included in the Create Incident record producer form to display items based on keywords entered in the description. These items can be knowledge articles, service catalog items, and social Q&A records. These search results appear as the user types the information.
Figure 552: Contextual Search widget

**Faceted Search widget**

The Faceted Search widget displays search results and search facets defined for a search source. The Faceted Search widget enables end users to filter search results for a more meaningful result set.
Figure 553: Faceted Search widget

Table 1135: Faceted Search instance options

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facet List Title</td>
<td>Display title for the facet component.</td>
</tr>
<tr>
<td>Typeahead Search - Title</td>
<td>Default text in the typeahead search component.</td>
</tr>
<tr>
<td>Typeahead Search - Color</td>
<td>Whether the glyph in the typeahead component is filled in.</td>
</tr>
<tr>
<td>Typeahead Search - Glyph</td>
<td>Icon that appears in the search field beside the widget.</td>
</tr>
<tr>
<td></td>
<td>The search icon is the default. To use a different icon, type the name of</td>
</tr>
<tr>
<td></td>
<td>the icon in the field, for example search-plus. For a list of icons to</td>
</tr>
<tr>
<td></td>
<td>choose from, open the instance options for the Icon Link widget.</td>
</tr>
<tr>
<td>Typeahead Search - Size</td>
<td>Determines the font size and height of the widget. Choose from xs, sm, md,</td>
</tr>
<tr>
<td></td>
<td>lg.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Max results for All search</td>
<td>Maximum number of results that display for all search sources when viewed together.</td>
</tr>
<tr>
<td>Max results for single search source</td>
<td>Maximum number of results that display for a single search source.</td>
</tr>
<tr>
<td>Show Did You Mean</td>
<td>Displays suggestions when a search produces no results.</td>
</tr>
<tr>
<td>Typeahead Search - Limit</td>
<td>Number of typeahead search results displayed. The default is 15.</td>
</tr>
</tbody>
</table>

For more information on configuring search, see [Service Portal search](#) on page 2856.

**Home Page Search widget**
Add a search bar to your homepage.

Configure your own search sources to constrain what topics appear on search, or just use the default search sources. For more information on configuring search, see [Service Portal search](#) on page 2856.
Figure 554: Home Page Search widget

Instance options

Table 1136: Home page search widget instance options

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>Name that appears above the search bar. For example &quot;How can we help?&quot;</td>
</tr>
<tr>
<td>Short description</td>
<td>A subtitle that appears below the title.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Typeahead search</td>
<td>Controls the appearance of the search bar. Use a comma separated list inside curly braces to add style details to the search bar, for example</td>
</tr>
<tr>
<td>Title</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Deleted Email Recovery</td>
<td>Deleted Email Recovery By default, every email deleted from your OWA mailbox goes through the following process: The email is moved to your Deleted Items folder. If you purge or remove items from your Deleted Items folder, they are deleted permanently.</td>
</tr>
<tr>
<td>What is Spam?</td>
<td>What is Spam? Spam has increasingly become a problem on the Internet. While every Internet user receives some spam, email addresses posted to web sites or in newsgroups and chat rooms attract the most spam.</td>
</tr>
<tr>
<td>How to Deal with Spam</td>
<td>How to Deal with Spam Spam has increasingly become a problem on the Internet. While every Internet user receives some spam, email addresses posted to web sites or in newsgroups and chat rooms attract the most spam.</td>
</tr>
<tr>
<td>What are phishing scams and how can I avoid them?</td>
<td>Phishing explained. Phishing scams are typically fraudulent email messages appearing to come from legitimate enterprises (e.g., your company, your Internet service provider, your bank).</td>
</tr>
</tbody>
</table>

**Figure 555: Search Page widget**
Figure 556: Search Page instance options

Table 1137: Search page instance options

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Show score</td>
<td>When selected, shows search results relative to ranking.</td>
</tr>
<tr>
<td>Max results for All search</td>
<td>The maximum number of results that show for all search groups when viewed together.</td>
</tr>
<tr>
<td>Max results for single search group</td>
<td>The maximum number of results that show for a single search group when you view that specific search group.</td>
</tr>
<tr>
<td>Show Did You Mean</td>
<td>Displays suggestions when a search produces no results.</td>
</tr>
</tbody>
</table>

For more information on configuring search, see *Service Portal search* on page 2856.

*Typeahead Search widget*
Predictive search feature that shows words as users type.
Figure 557: Typeahead Search widget

Figure 558: Typeahead search instance options
Table 1138: Instance option fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>The name or words that appear in the search field before a user starts typing. For example, search or what are you looking for</td>
</tr>
<tr>
<td>Color</td>
<td>Whether the search button beside the search field is filled in or not</td>
</tr>
<tr>
<td>Glyph</td>
<td>The icon that appears in the search field beside the widget. The search icon is the default. To use a different icon, type the name of the icon in the field, for example search-plus. For a list of icons to choose from, open the instance options for the Icon Link widget.</td>
</tr>
<tr>
<td>Size</td>
<td>Determines the font size and height of the widget. Choose from xs, sm, md, and lg.</td>
</tr>
<tr>
<td>Limit</td>
<td>The number of typeahead search entries you want to display. The default number is 15.</td>
</tr>
<tr>
<td>Contextual Search Sources</td>
<td>Limit the results available in the typeahead search by only configuring specific search sources. For example, users searching in the Service Catalog only see results for the Service Catalog when that search sources is configure. For more information on contextual search, see Configure Search Sources available on a page on page 2873</td>
</tr>
</tbody>
</table>

Knowledge Management widgets

Use Knowledge Management widgets to build a knowledge base for your portal.

Knowledge Management widgets are included as part of the Service Portal - knowledge base plugin [com.glide.service-portal.knowledge-base], which is activated automatically with the Service Portal for Enterprise Service Management [com.glide.service-portal.esm] plugin.

For more information on knowledge management, see Knowledge Management on page 1374.

KB also in Category widget
List of articles also included within a particular category.

The information that appears in the KB also in Category widget is determined by the knowledge article child categories. For more information, see Define a knowledge article category on page 1410.
Also in Windows

What is the Windows key?

How to set or change your default web browser

How can I restore my computer to a previous configuration?

Figure 559: KB also in Category widget

Instance options

KB Also in Topic

Bootstrap color

Primary

Save (Esc + s)

Figure 560: KB also in Category instance options

Table 1139: Instance Options

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bootstrap color</td>
<td>Color scheme for the widget. The default colors are defined by the portal theme, but if you want the instance to have a specific color, select the option from the list.</td>
</tr>
</tbody>
</table>

KB Article Comments widget
Rating and comment option for knowledge base articles.

Ratings on articles in the KB Article Comments widget determine the article popularity in the KB top rated widget.
Add your comment

Rate this article ★★★★★ Submit

Figure 561: KB Article Comments widget

Instance Options

Table 1140: Instance options fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Show star rating</td>
<td>Select the option to show a star rating on the KB article comments widget. Selecting the Use system properties option shows the star rating option based on the glide.knowman.show_star_rating system property.</td>
</tr>
<tr>
<td>Show user comments</td>
<td>Select the option to show the comment box on the KB article comments widget. Selecting the Use system properties option shows the comment box based on the glide.knowman.show_user_feedback system property.</td>
</tr>
</tbody>
</table>

KB Article Page widget
Use the Article page widget to view Knowledge Base articles within Service Portal.
Any specialized font or formatting added in the text field for the knowledge article within the platform, appears the same way in the portal.
Getting Around in Windows

Windows 8.x

Windows 8.x is designed for using touch, mouse, and keyboard together, on hardware ranging from touch-enabled tablets and laptops to PCs and all-in-one computers, including those without touch capability.

Start screen and Desktop

- 8.1: Microsoft updated the Windows 8.1 interface by returning the Start button, providing its ease of access along with the option of the Metro interface. The intent is to provide a seamless experience on desktops, laptops, tablets, and phone devices.
  By default, the Start screen is displayed. Move your mouse pointer to the bottom left corner of the screen to make the Start button appear. Click it to display the desktop; click it again to display the Start screen.
- 8: The Start screen has a default application display you can customize:
  1. Right-click any app and the Application bar will appear at the bottom, with options for the application you have selected.
  2. To add an app to the Start screen, click Pin to Start.
  If an application is already on the Start screen, you'll see Unpin from Start instead.

Power User menu

The Power User menu displays the most commonly used applications from the Control Panel, File Explorer, and Task Manager, as well as Restart, Run, Search, and Shutdown/Update. Access it in one of the following ways:

- Press Win + X

Figure 563: KB Article Page widget
Instance Options

Figure 564: KB article page widget instance options

Table 1141: Instance options

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bootstrap color</td>
<td>Color scheme for the widget. The default colors are defined by the portal theme, but if you want the instance to have a specific color, select the option from the list.</td>
</tr>
<tr>
<td>Show star rating</td>
<td>Displays the star rating on the article page widget. If you select Use system properties, the appearance of the star rating is defined by the glide.knowman.show_star_rating system property.</td>
</tr>
</tbody>
</table>

KB Categories widget
Lists the categories for your Knowledge Base.
Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applications</td>
<td>2</td>
</tr>
<tr>
<td>Devices</td>
<td>1</td>
</tr>
<tr>
<td>IT</td>
<td>7</td>
</tr>
<tr>
<td>Email</td>
<td>8</td>
</tr>
<tr>
<td>Suppliers</td>
<td>1</td>
</tr>
<tr>
<td>Operating Systems</td>
<td>12</td>
</tr>
</tbody>
</table>

**Figure 565: KB Categories widget**

Categories are determined by the list of Knowledge Categories provided for the Knowledge Base. To view a list of categories for a knowledge base, in the platform navigate to Knowledge Administration Knowledge bases, then select the name of the knowledge base, for example IT. Categories for the knowledge base appear in the related lists. If a category does not have any associated articles, it does not appear in the portal. For more information on defining categories for a knowledge base, see *Define a knowledge article category* on page 1410.

The knowledge base a portal uses is determined in the portal form. On the Service Portal configuration page (Service Portal Service Portal configuration) click Portals in the header menu. Select a portal from the list, then in the knowledge base list, select a knowledge base.
### Service Portal

#### Service Portal

| *Title*
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Portal</td>
</tr>
</tbody>
</table>

| *URL suffix*
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>sp</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Homepage</th>
</tr>
</thead>
<tbody>
<tr>
<td>index</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Knowledge base</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Social</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>KB home</th>
</tr>
</thead>
<tbody>
<tr>
<td>kb_view2</td>
</tr>
</tbody>
</table>

**Figure 566: Select knowledge base**

### Instance options

The KB categories widget does not include instance options.

*KB Category Page widget*

Articles and article preview within a particular category. Categories are specified within the Knowledge Base module.
Excel Functionality

Excel Functionality Copying formulas without changing cell locations When you want to know how to copy a formula and keep portions of the formula from changing relative to where they are being copied, precede each portion of the cell specifications that aren't supposed to

 Instance options

[Figure 568: KB category widget instance options]

Managing Settings in Internet Explorer 10 for Windows 8

Summary Learn to set up a home page, connection settings, and parental control in Internet Explorer. Solution Want to set up a default home page? Want to set up your Internet connection? Need to block the types of sites that display on your computer? Learn how to do all this in

 Instance options

[Figure 568: KB category widget instance options]
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bootstrap color</td>
<td>Color scheme for the widget. The default colors are defined by the portal theme, but if you want the instance to have a specific color, select the option from the list.</td>
</tr>
<tr>
<td>Show star rating</td>
<td>Displays the star rating on the category page. If you select Use system properties, the appearance of the star rating is defined by the glide.knowman.show_star_rating system property.</td>
</tr>
</tbody>
</table>

**KB Most Viewed widget**  
List of most viewed knowledge base articles, based on user feedback.

<table>
<thead>
<tr>
<th>Most Viewed Articles</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Getting Around in Windows</strong></td>
</tr>
<tr>
<td>4 Views</td>
</tr>
</tbody>
</table>

**Figure 569: KB Most Viewed widget**
Instance options

Figure 570: KB most viewed widget instance options

Table 1143: Instance options fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>The name that appears in the widget header</td>
</tr>
<tr>
<td>Bootstrap color</td>
<td>Color scheme for the widget. The default colors are defined by the portal theme, but if you want the instance to have a specific color, select the option from the list.</td>
</tr>
<tr>
<td>Max number</td>
<td>The maximum number of most viewed articles listed</td>
</tr>
<tr>
<td>KB category</td>
<td>KB category for the most viewed articles. The list is generated by the kb_category table.</td>
</tr>
</tbody>
</table>

KB News widget
The KB News widget displays information from the Knowledge Base.

You can configure the KB News widget to display specific information by selecting a category from the KB category list.
Figure 571: KB News widget

Instance options

Title: News
Bootstrap color: Default
Max number:
KB category:

Figure 572: KB news widget instance options

Table 1144: Instance option fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>Name of the widget that appears in the widget header</td>
</tr>
<tr>
<td>Bootstrap color</td>
<td>Color scheme for the widget. The default colors are defined by the portal theme, but if you want the instance to have a specific color, select the option from the list.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Max number</td>
<td>The maximum number of news articles appearing in the widget. The default number is 5.</td>
</tr>
<tr>
<td>KB category</td>
<td>The knowledge base category determined by the kb_category table. Only published articles display. For a news widget, select something like Announcements to show upcoming events.</td>
</tr>
</tbody>
</table>

**KB Search widget**

The KB Search widget is a search widget that is specifically confined to the knowledge base.

The *typeahead search widget* is embedded in the KB search widget.

![KB Search widget](image)

*Figure 573: KB Search widget*
Instance options

Figure 574: KB search widget instance options

Table 1145: Instance option fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>Name of the widget. This field is non-public facing.</td>
</tr>
</tbody>
</table>

*KB Top Rated widget*

Lists Knowledge Base articles with the highest rating. Ratings are determined by user feedback.

**Top Rated Articles**

- **Eclipse configuration for Java development**
  ★★★★★

Figure 575: KB Top Rated widget
Instance options

Figure 576: KB top rated widget instance options

Table 1146: Instance options fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>The name that appears in the widget header</td>
</tr>
<tr>
<td>Bootstrap color</td>
<td>Color scheme for the widget. The default colors are defined by the portal theme, but if you want the instance to have a specific color, select the option from the list.</td>
</tr>
<tr>
<td>Max number</td>
<td>The maximum number of most viewed articles listed</td>
</tr>
<tr>
<td>KB category</td>
<td>KB category for the top rated articles. The list is generated by the kb_category table.</td>
</tr>
</tbody>
</table>

KB View widget
The KB View widget is an example of how to structure a knowledge base page.

Use the search filter to find a specific topic or article.
The KB view widget does not have any included instance options.
**KB View 2 widget**
The KB View 2 provides an alternative structure to the KB View widget to show a different example of how to display knowledge articles.

![KB View 2](image)

**Figure 578: KB View 2**

**Instance options**
The KB View 2 widget does not have any included instance options.

**My Favorite Tags widget**
The My Favorite Tags widget allows you to follow specific questions based on the tags. By saving favorite tags, you can see questions that are specific to that tag.
**Instance options**

The My Favorite Tags widget does not have any included instance options.

*Popular Questions widget*

List of popular questions asked in the community.
### Popular Questions

<table>
<thead>
<tr>
<th>Question</th>
<th>User</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>What’s the best way to find meeting rooms in the office?</td>
<td>Joe Employee</td>
<td>4mo ago</td>
</tr>
<tr>
<td>What is the process for getting company approved banners and images?</td>
<td>Abel Tuter</td>
<td>4mo ago</td>
</tr>
<tr>
<td>What are the pros and cons between OSX and Windows machines?</td>
<td>Joe Employee</td>
<td>4mo ago</td>
</tr>
<tr>
<td>How do you install the wireless printer on OSX?</td>
<td>Adela Cervantsz</td>
<td>4mo ago</td>
</tr>
<tr>
<td>Where is tipping expected? Is that a business expense?</td>
<td>Beth Anglin</td>
<td>4mo ago</td>
</tr>
</tbody>
</table>

Figure 580: Popular Questions widget

**Instance options**

The Popular Questions widget does not have any included instance options.

*SQANDA Create Question widget*

Type your own question. Add a tag for better searchability.
Figure 581: SQANDA Create Question widget

**Instance options**

The SQANDA Create Question widget does not have any included instance options.

*SQANDA Question widget*

Use the Social Q&A question widget to view and respond to questions.
Has anyone tried ordering accessories that are not listed on the catalog?

1

I want to order an ergonomic mouse but everything in the company catalog is pretty basic. Can I just order one online and expense it if it's the same price?

Share • Comment

4mo ago • Asked by Abel Tuter

0

You can always consult with your manager and they may be already on the approved list of accessories. You can also submit a request and we'll let you know if you should order it and expense it.

Comment • Edit

4mo ago • Answered by System Administrator

Your Answer

Post Your Answer

Figure 582: SQANDA Question widget
Instance options

The SQANDA Question widget does not have any included instance options.

SQANDA Related Question widget
Lists statistics about a question as well as recently asked questions.
The SQANDA Related Questions widget does not have any included instance options.
**Subscribed Questions widget**

The Subscribed Questions widget allows you to see questions you have subscribed to.

You can subscribe to questions other people have asked by selecting the star icon underneath the question.

![My Subscribed Questions widget](image)

**Figure 584: Subscribed Questions widget**

**Instance options**

![Instance options fields](image)

**Table 1147: Instance options fields**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bootstrap color</td>
<td>Color scheme for the widget. The default colors are defined by the portal theme, but if you want the instance to have a specific color, select the option from the list.</td>
</tr>
</tbody>
</table>

**Tagged Question List widget**

List of questions sortable by tag, time it was asked, top rated, and unanswered.

The Tagged Questions List widget generates the list based on tags that users have applied to questions.
### Newest Questions

<table>
<thead>
<tr>
<th>#</th>
<th>Question</th>
<th>Answer</th>
<th>Votes</th>
<th>Date</th>
<th>User</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Does anyone know a good template for work email signature?</td>
<td>marketing, email</td>
<td>1</td>
<td>4mo ago</td>
<td>Mara Rineheart</td>
</tr>
<tr>
<td>2</td>
<td>What's the best way to find meeting rooms in the office?</td>
<td>office, meeting, facilities</td>
<td>2</td>
<td>4mo ago</td>
<td>Joe Employee</td>
</tr>
<tr>
<td>3</td>
<td>What are the pros and cons between OSX and Windows machines?</td>
<td>windows, Laptop, OSX</td>
<td>1</td>
<td>4mo ago</td>
<td>Joe Employee</td>
</tr>
<tr>
<td>1</td>
<td>Any suggestions on using the company credit card?</td>
<td>expenses, company card</td>
<td>0</td>
<td>4mo ago</td>
<td>Joe Employee</td>
</tr>
</tbody>
</table>

**Figure 586: Tagged Question List widget**
**Instance options**

The SQANDA Tagged Question List widget does not have any included instance options.

**Service Catalog widgets**

Use the Service Catalog widgets to build a catalog for your portal.

Most service catalog widgets are part of the Service Portal Service Catalog [com.glide.service-portal.service-catalog] plugin that is activated automatically with the Service Portal for Enterprise Service Management (com.glide.service-portal.esm) plugin.

The Service Portal - Service Catalog v2 plugin (com.glideapp.servicecatalog.portal) provides an enhanced Service Catalog experience. This plugin is active by default for zBoot users and enables the following widgets:

- Catalog Homepage Search (ID: cat-homepage-search)
- SC Scroll to top (ID: sc-scroll-to-top)
- Requests and Approvals
- Recent & Popular Items (ID: sc-recent-popular)

Most of the configuration for the Service Catalog widgets takes place in the Service Catalog application of the platform. For more information on Service Catalog, see Service Catalog.

**Enable new Service Catalog widgets in Service Portal**

For upgrade customers, enable the new Service Catalog widgets in Service Portal to access the latest features. By default, the deprecated widgets are enabled.

Role required: admin and sp_admin.

---

**Note:** For information about the deprecated Service Catalog widgets in Service Portal, see the Kingston documentation.

---

1. Activate the plugins (if applicable) in the following order.
   1. Service Portal for Enterprise Service Management (com.glide.service-portal.esm)
   2. Service Portal - Service Catalog (com.glide.service-portal.service-catalog)
   3. Service Portal - Service Catalog v2 (com.glideapp.servicecatalog.portal)

2. Enable the SC Catalog Item widget.
   a) Navigate to a catalog item.
   b) Press the Ctrl key, click on the widget, and select Instance in Page Editor.
   c) From the Widget choice list, select SC Catalog Item.

3. Enable the SC Order Guide widget.
   a) Navigate to an order guide.
   b) Press the Ctrl key, click on the widget, and select Instance in Page Editor.
   c) From the Widget choice list, select SC Order Guide.

4. Enable the SC Shopping Cart widget.
   a) Access the shopping cart.
   b) Press the Ctrl key, click on the widget, and select Instance in Page Editor.
   c) From the Widget choice list, select SC Shopping Cart.
d) In the Additional options, JSON format field, specify the following code:

"cartTemplate": "large_shopping_cart_v2.html"

e) Navigate to Catalog Administration Properties and enable the Use Cart V2 widget in Header Menu widget (glide.sc.portal.use_cart_v2_header) property.

The SC Shopping Cart widget is displayed in the header menu.

**SP Variable Editor widget**

The Variable Editor widget allows you to change the specifications you chose for an item in the Service Catalog.

You can embed the variable editor widget in the shopping cart widget, to allow users to edit and make changes to their cart items. The options included in the widget are determined by the specific catalog item and the variables that have been configured for it.

For more information on the service catalog variables that are available in Service Portal, see *Types of service catalog variables*. 
### Variables

<table>
<thead>
<tr>
<th>Allocated carrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sprint Nextel</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Monthly data allowance</th>
</tr>
</thead>
<tbody>
<tr>
<td>500MB [$1 Monthly]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contract duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 Months</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>64GB</td>
</tr>
</tbody>
</table>

---

**Figure 587: Variable Editor widget**

**Instance Options**

The Variable Editor widget is embedded as part of the shopping cart widget, therefore no instance options are included.

**Catalog Content widget**

The Catalog Content widget is part of the Service Catalog and includes a tiled list of all the content items available in the catalog.
The items that appear on the page are grouped by category alphabetically. Catalog items and categories are defined in the Service Catalog application in the platform. For more information on creating catalog items to appear in the catalog, see *Create or edit a catalog item*.

![Catalog Content widget](image)

**Figure 588: Catalog Content widget**

**Instance Options**

The Catalog Content widget does not include instance options.

*Request Fields widget*

The Request Fields widget display information about any request a user has made.

Fields for the Request Fields widget are defined by the HTML template and the server.
Figure 589: Request Fields widget

**Instance options**

*Table 1148: Request fields widget instance options*

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pickup message</td>
<td>Information that appears at the bottom of the widget. Make sure any changes you make are within the curly braces. The default is <code>${Requests are picked up within &lt;br/&gt;4 hours (M-F 9-5)}</code></td>
</tr>
</tbody>
</table>

Requested Items widget
Describes at what stage of the order a requested item is.

You can define different workflows for items directly within the Service Catalog module. For more information on Service Catalog workflows, see *Service Catalog request fulfillment.*
Figure 590: Requested Items widget
## Instance options

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>Requested Items</td>
</tr>
<tr>
<td>Bootstrap color</td>
<td>Primary</td>
</tr>
<tr>
<td>Display field</td>
<td>Short description</td>
</tr>
<tr>
<td>Table</td>
<td>Requested Item [sc_req_item]</td>
</tr>
<tr>
<td>Link to this page</td>
<td>ticket</td>
</tr>
<tr>
<td>Maximum entries</td>
<td>20</td>
</tr>
</tbody>
</table>

© 2018 ServiceNow. All rights reserved. 2764
## Table 1149: Requested Items instance options fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>Name of the widget. The title appears in the header of the widget.</td>
</tr>
<tr>
<td>Bootstrap color</td>
<td>Color scheme for the widget. The default colors are defined by the portal theme, but if you want the instance to have a specific color, select the option from the list.</td>
</tr>
<tr>
<td>Display field</td>
<td>Determine what information displays as the title for each requested item. Short description is the default.</td>
</tr>
<tr>
<td>Filter</td>
<td>Limit what appears in the list using a filter. You can add a filter by opening the Requested Items record in the platform (From the context menu, click Open in platform) and using the condition builder.</td>
</tr>
<tr>
<td>Table</td>
<td>Table that displays the item when the user clicks an entry.</td>
</tr>
<tr>
<td>Link to this page</td>
<td>Page that opens when the user clicks an item</td>
</tr>
<tr>
<td>Maximum entries</td>
<td>Max number of entries that appear in the list of requested items</td>
</tr>
</tbody>
</table>

**SC Catalog Item widget**

Use this widget (widget-sc-cat-item-v2) to view the information about a catalog item and order the item.

Configure [catalog items](#) using the Service Catalog in the platform UI by navigating to **Service Catalog Catalog Definitions Maintain Items**.

Catalog variables determine what information your users are allowed to select from, for example, color, size, or price. For more information on defining the variables for a catalog item, see [Create a service catalog variable](#).
Apple iPad 3

iPad with Retina display Wi-Fi 16GB - Black

Key Features:
- Retina display (2048x1536 resolution)
- 16GB storage
- Wi-Fi enabled
- Built-in speaker, microphone and camera
- Up to 10 hours battery life

List Collector

Add attachments

Figure 592: SC Catalog Item Widget
Instance options

Use the widget instance options to customize the settings for the SC Catalog Item widget. To customize the settings for this widget, press the Ctrl key, click on the widget, and select Instance Options.

Table 1150: Instance options for the SC Catalog Item widget

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Presentation</strong></td>
<td></td>
</tr>
<tr>
<td>Bootstrap color</td>
<td>Color of the widget based on the selections made in the Branding Editor.</td>
</tr>
<tr>
<td><strong>Other Options</strong></td>
<td></td>
</tr>
<tr>
<td>Show Add Cart Button</td>
<td>Displays the Add to Cart button in the Order Item widget.</td>
</tr>
<tr>
<td>Show field validation messages</td>
<td>Displays the Required information section with mandatory fields whose values are not specified.</td>
</tr>
<tr>
<td>Show Add/Update Wish List buttons</td>
<td>Displays the Add to Wish List or the Update Wish List buttons in the Order Item widget.</td>
</tr>
<tr>
<td>Order Item Section on Top</td>
<td>Displays the Order Item widget to the right of the catalog item form. Else, the Order Item widget is displayed below the catalog item form.</td>
</tr>
<tr>
<td>Enable Show More/Less for Item description on Mobile</td>
<td>Enables the Show more or Show less options for the catalog item description in the mobile view. By default, the Show more option is available.</td>
</tr>
<tr>
<td></td>
<td>• Click Show more to display the entire description.</td>
</tr>
<tr>
<td></td>
<td>• Click Show less to display only 150 characters of the description.</td>
</tr>
</tbody>
</table>

**SC Categories widget**

The SC Categories widget displays Service Catalog categories.

The system renders the categories available in this widget from the Categories table in Service Catalog [sc_category].
Table 1151: Categories widget instance options fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data</td>
<td></td>
</tr>
<tr>
<td>Page</td>
<td>Defines what page opens when a user clicks a category. By default, this</td>
</tr>
<tr>
<td></td>
<td>option redirects to the page for the selected category.</td>
</tr>
<tr>
<td>Number of categories to</td>
<td>Specifies the number of categories displayed in the Categories pane. By</td>
</tr>
<tr>
<td>load</td>
<td>default, ten categories are displayed. If there are additional categories,</td>
</tr>
<tr>
<td></td>
<td>the Show All option is available.</td>
</tr>
<tr>
<td>Presentation</td>
<td></td>
</tr>
<tr>
<td>Bootstrap color</td>
<td>Color scheme for the widget. The default colors are defined by the portal</td>
</tr>
<tr>
<td></td>
<td>theme, but if you want the instance to have a specific color, select the</td>
</tr>
<tr>
<td></td>
<td>option from the list.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Category Layout</td>
<td>Select a flat or nested layout. A flat layout shows all of the available categories. A nested layout shows only the parent categories. Use a nested layout if you have a large number of categories to prevent an unnecessarily long list. Click that appears next to a category with nested topics to expand the sub-categories. The widget only supports three levels of nesting. After level four, categories appear in the flat view.</td>
</tr>
<tr>
<td>Behavior</td>
<td></td>
</tr>
<tr>
<td>Hide at XS</td>
<td>Hides the categories option on small screens, for example, on smartphones. The default is set to false.</td>
</tr>
<tr>
<td>Omit badges</td>
<td>Show or hide the number of items included in each category.</td>
</tr>
<tr>
<td>Check canView per item</td>
<td>Verifies with each item that the user has the right roles to view the catalog item.</td>
</tr>
</tbody>
</table>

**Note:** If a category contains more than 200 items, update the following instance options on this widget for better performance:

- Category Layout: Flat
- Omit badges: True

**SC Category Page widget**

Lists the catalog items available within a certain category. Categories are determined within the Service Catalog module.

**Note:** Catalog items are sorted in ascending order by their Order value. If catalog items have the same order, they are sorted by the Name field.
Table 1152: Category page widget instance options fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Click event name</td>
<td>The name of the event that is emitted when a user clicks a catalog item. You can override the default behavior when clicking on a catalog item by providing a different event name. This would be in a situation where you embedded the category page in another widget. The default value is $sp.cat_item_list.click.</td>
</tr>
</tbody>
</table>
### Field

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of items to display per page</td>
<td>Number of items to display in the category page. Note: When defining the number of items to be displayed, consider the item data such as images and long descriptions. A large number may slow down the page performance.</td>
</tr>
<tr>
<td>Show items from Child Categories</td>
<td>Displays items in the child categories along with those in the parent category. Note: If the Category Layout instance options is set to Flat in the SC Categories widget, then set this instance option to False.</td>
</tr>
</tbody>
</table>

**SC Order Guide widget**

Use this widget (widget-sc-order-guide-v2) to request an order guide, that is, a single service catalog request for several catalog items with a specific purpose.

Configure **Order guides** using the Service Catalog in the platform UI by navigating to Service Catalog Catalog Definitions Order Guides.

The order guide form comprises the following sections:

### Describe Needs

This section displays the following that are associated with the order guide:

- Image
- Description
- Variables

### Choose Options

This section displays a list of catalog items included in the order guide based on the information provided in the Describe Needs section and the rule base configured for the order guide. Each catalog item is displayed with its name and description on an accordion.

Each accordion displays:

- Options, if a catalog item has fields that need user inputs. Note: If the fields are mandatory, a red asterisk is displayed beside Options.
- A toggle to include the catalog item in the order guide request. You can make it mandatory to include all items in the order guide request by not displaying the toggle. You can make it optional to include items in the order guide request by displaying the toggle. To display the toggle for each catalog item of the order guide, select the Show Include Toggle (Service Portal) check box while configuring the order guide. For more information, see Create an order guide.
**Note:** When an item is excluded from the order guide request, the item is not editable and the corresponding mandatory field restrictions are ignored.

**Summary**

This section provides a summary of the order guide that you can review before requesting the order guide.

**Instance options**

Use the widget instance options to customize the settings for the SC Order Guide widget. To customize the settings for this widget, press the Ctrl key, click on the widget, and select Instance Options.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Presentation</strong></td>
<td></td>
</tr>
<tr>
<td>Title</td>
<td>Name of the order guide.</td>
</tr>
<tr>
<td>Bootstrap Color</td>
<td>Color of the widget based on the selections made in the Branding Editor.</td>
</tr>
<tr>
<td>Compact Mode</td>
<td>Displays the widget in the compact mode when configured for smaller real estates (less than 6*6).</td>
</tr>
<tr>
<td><strong>Other Options</strong></td>
<td></td>
</tr>
</tbody>
</table>
| Enable Show More/Less for Item description on Mobile | Enables the Show more or Show less options for the description of the order guide or the associated catalog items in the mobile view. By default, the Show more option is available.  
• Click Show more to display the entire description.  
• Click Show less to display only 150 characters of the description. |

**Note:** This instance option is applicable for the description of the order guide in the Describe Needs section, and the description of the associated catalog items in the Choose Options section.

**SC Popular Items widget**

List of service catalog items that users purchase often.
Popular Items

Apple iPad 3

Executive Desktop

$600.00

$1,875.00

View Details

View Details

Figure 595: SC Popular Items widget

Instance Options

Table 1154: Popular Item widget instance option fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limit</td>
<td>Maximum number of popular items shown. The default number is 9.</td>
</tr>
<tr>
<td>Include Record Producers</td>
<td>Includes requests made through record producers.</td>
</tr>
</tbody>
</table>

SC Wish List Cart widget

Use this widget to add catalog items or record producers to the wish list so that you can review them.
If the wish list is enabled for Service Catalog, SC Wish List Cart widget (sc_wishlist_cart) is available in Service Portal. Once enabled, the following options are available:

- The Wish List menu option on the main navigation bar.
- The Add to Wish List button in the Ordering widget for catalog items and record producers.
- A wish list details page that displays all items in the Wish List.

From the wish list details page, you can view or delete catalog items, clear the wish list, or navigate to the Service Catalog landing page.

![Figure 597: SC Wish List Cart widget](image)

### Instance options

Use the widget instance options to customize the settings for the SC Wish List Cart widget. To customize the settings for this widget, press the Ctrl key, click on the widget, and select Instance Options.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto update wish list</td>
<td>Automatically updates the wish list across all sessions.</td>
</tr>
</tbody>
</table>

Enable the SC Wish List Cart widget in Service Portal

You can add catalog items or record producers to the wish list after you enable the wish list.

Role required: admin and sp_admin

1. Navigate to Service Catalog Maintain Catalogs.
2. Select Service Catalog.
3. Select the Enable Wish List check box.  
The Wish List menu option is displayed on the Service Portal header.

   **Note:** The Use the sc_layout driven cart macros (default true) (glide.sc.use_cart_layouts) property must be set to true to enable the wish list.

4. Perform these additional steps only for upgrade customers to enable the Wish List menu option in the Service Portal banner.
   a) Navigate to Service Portal Service Portal Configuration.
   b) Click Portals from the banner.
   c) Ensure that Service Portal is selected in the first choice list.
   d) Select SP Header Menu in the portal hierarchy chart.
   e) In the Additional options, JSON format field, set the enable_wishlist value as true.

   ```json
   "enable_wishlist": {
       "displayValue": "true",
       "value": true
   }
   ```
Figure 598: Enable the SC Wish List Cart widget

5. Enable the Add to Wish List icon (계획) in the Ordering widget of a catalog item or record producer:
   a) Navigate to Service Portal Service Portal Home Order Something.
Enable automatic updates to the wish list
Updates the wish list with user-specific changes from multiple tabs and platforms.
Role required: admin or sp_admin
1. Navigate to Service Portal Service Portal Home.
The Service Portal homepage is displayed.
2. Click the wish list.
3. Press the Ctrl key, click the wish list widget, and select Instance Options.
4. Select the Auto update wish list check box.
5. Perform these additional steps only for upgrade customers.
a) Navigate to Service Portal Service Portal Configuration.
b) Select Portals from the header.
c) Ensure that Service Portal is selected in the first choice list.
d) Select SP Header Menu in the portal hierarchy chart.
e) In the Additional options, JSON format field, set the auto_update_wishlist value as true.

    "auto_update_wishlist": {
        "displayValue": "true",
        "value": true}
**Figure 599: Automatic updates to the wish list**

*SC Save Bundles widget*

The Save Bundles widget allows you to save specific catalog items together for reuse.
The Save Bundles widget is embedded within the SC Shopping Cart widget.

<table>
<thead>
<tr>
<th>Create New Bundle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Here, you can save the current contents of your cart as a bundle, which can be restored at any time.</td>
</tr>
<tr>
<td>To create a new bundle, provide a name for your bundle, select the items you would like to include in the bundle, and press save.</td>
</tr>
<tr>
<td>Bundle Name</td>
</tr>
</tbody>
</table>

| | Apple iPhone 5 | $599.99 | 1 | $599.99 |
| | | + $31.00 Monthly |  | + $31.00 Monthly |
| | Logitech USB Headset for PC & Mac | $29.99 | 1 | $29.99 |
| | PC/Mac Compatible Headset |  |  |  |
| | Sales Laptop | $1,100.00 | 1 | $1,100.00 |
| | Acer Aspire NX | + $100.00 Annually |  | + $100.00 Annually |

Save

Figure 600: SC Save Bundles widget

Instance Options

The Save Bundles widget does not have any included instance options.

*SC Saved Carts widget*

The Saved Carts widget shows previously created and saved bundles from the Service Catalog.
When you add an existing cart bundle to a shopping cart, you have two options. You can:

- Replace the items in the shopping cart with the items in the bundle.
- Add the bundle in addition to the rest of the items in the cart.

**iPad + phone**

*Replace Cart* will remove the current contents of your cart and replace it with the bundle.

*Add to Cart* will add the contents of the bundle into your cart without removing its current contents.

**Items In Bundle**

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
<th>Quantity</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Google Nexus 7</td>
<td>$199.99</td>
<td>1</td>
<td>$199.99</td>
</tr>
<tr>
<td>Apple iPad 3</td>
<td>$600.00</td>
<td>1</td>
<td>$600.00</td>
</tr>
</tbody>
</table>

**Figure 602: Add bundle items to a cart**
Instance Options

The Saved Carts widget does not have any included instance options.

SC Shopping Cart widget
The SC Shopping Cart widget (sc-shopping-cart-v2), used with Service Catalog, stores all your orders at one place.

Use the shopping cart widget to:

- Control the quantity of items in the cart.
- Add items to a cart. This information is stored in the sc_cart table.
- Define who the items are being requested for.
- Save specific items together as a bundle, which can be reloaded later. You can replace the cart items with the saved bundles, or add the bundles to the cart items.
- Remove all items from your cart.
Your Cart

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
<th>Quantity</th>
<th>Subtotal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple iPad 3</td>
<td>$600.00</td>
<td>1</td>
<td>$600.00</td>
</tr>
<tr>
<td>Standard Laptop</td>
<td>$1,100.00 + $100.00 Annually</td>
<td>1</td>
<td>$1,200.00 + $100.00 Annually</td>
</tr>
</tbody>
</table>

Total price: $1,700.00 + $100.00 Annually

Continue Shopping  Save as Bundle  Clear Cart  Proceed to Checkout

My Saved Bundles

Bundle1

Remove  | Open

Figure 603: SC Shopping Cart widget

Instance options

Use the widget instance options to customize the settings for the SC Shopping Cart widget. To customize the settings for this widget, press the Ctrl key, click on the widget, and select Instance Options.
### Table 1156: Instance options for the SC Shopping Cart widget

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Presentation</strong></td>
<td></td>
</tr>
<tr>
<td>Bootstrap color</td>
<td>Color scheme for the widget. The default colors are defined by the portal theme, but if you want the instance to have a specific color, select the option from the list.</td>
</tr>
<tr>
<td><strong>Behavior</strong></td>
<td></td>
</tr>
<tr>
<td>Cart Template</td>
<td>Enter the name of a ng-template you want to use to provide a different template for the shopping cart. By default, two ng-templates are provided: small_shopping_cart_v2.html and large_shopping_cart_v2.html.</td>
</tr>
<tr>
<td>Auto update cart</td>
<td>Automatically updates the cart across all sessions.</td>
</tr>
</tbody>
</table>

**Enable the Shopping Cart widget**

The shopping cart widget is enabled automatically for instances upgrading to Istanbul, however, there are several ways to manually enable or disable the widget.

To enable the shopping cart for a catalog item:

1. Navigate to a catalog item on the Service Catalog page in Service Portal.
2. CTRL+right-click a catalog item widget to open the *widget instance options*.
3. Select or clear the Show Add Cart Button option to enable or disable the shopping cart for that particular catalog item.
Figure 604: Catalog item cart option

To enable the shopping cart in the portal header:

1. From the Service Portal configuration page, select the Portal editor.
2. Select the SP Header Menu in the portal hierarchy.
3. In the Additional options section, make sure the enable cart value is set to true. Set the value to false to hide the shopping cart.
Figure 605: Shopping cart in the header menu

```json
{
  "enable_cart": true,
  "displayValue": "true",
  "value": true
}
```
Enable automatic updates to the shopping cart
Updates the wish list with user-specific changes from multiple tabs and platforms.

Role required: admin or sp_admin

1. Navigate to Service Portal Service Portal Home. The Service Portal homepage is displayed.
2. Click Cart.
3. Press and hold the Ctrl key, click the wish list widget, and select Instance Options.
4. Select the Auto update cart check box.
5. Perform these steps only for upgrade customers.
   a) Navigate to Service Portal Service Portal Configuration.
   b) Select Portals from the header.
   c) Ensure that Service Portal is selected in the first choice list.
   d) Select SP Header Menu in the portal hierarchy chart.
   e) In the Additional options, JSON format field, set the auto_update_cart value as true.

"auto_update_cart": {
    "displayValue": "true",
    "value": true}
Figure 606: Automatic updates to the shopping cart
**SC Scroll to top widget**

In the Service Portal mobile view, the SC Scroll to top widget (sc_scroll_to_top) lets you scroll to the top of the screen after you scroll down.

This widget is displayed when you start to scroll upwards after reaching a specific screen height.
Figure 607: SC Scroll to top widget
Instance options

Use the widget instance options to customize the settings for the SC Scroll to top widget. To customize the settings for this widget, press the Ctrl key, click on the widget, and select Instance Options.

<table>
<thead>
<tr>
<th>Height from top (px)</th>
<th>Screen height where the widget is displayed when you start to scroll upwards.</th>
</tr>
</thead>
</table>

Service Portal configuration page widgets

Service Portal uses widgets for configuration. When you configure a page or a widget for a portal in the Service Portal Configuration page, you actually use Service Portal widgets to do so.

Service Portal configuration widgets are internal only and cannot be extended.

Configuration page widgets are included as part of the Service Portal Configuration Pages plugin [com.glide.service-portal.config], which is activated automatically when you activate the Service Portal for Enterprise Service Management plugin [com.glide.service-portal.esm].

Navigate to Service Portal Service Portal Configuration to view these widgets in action.

Service Portal Config Overview widget

The Service Portal Config Overview widget is the widget that appears on the sp_config homepage. Use this widget to navigate Service Portal Configuration.
Service Portal
Create rich, engaging and modern experiences to help your business run better
Select one of the options below to continue

- **Branding Editor**
  Customize your portal's title, logo and theme colors. Preview changes as you make them

- **Designer**
  Create and layout pages with drag-and-drop functionality. Preview pages as you make changes

- **Page Editor**
  Configure the properties of pages, containers and widgets from a map view

- **Widget Editor**
  Create widgets from scratch or customize an existing one. Write HTML, CSS, and Javascript with real-time preview

- **Get Help**
  Browse guides, tutorials and videos to learn how to set up, configure and customize your portals
**Portal config widget**
The Portal Config widget is the left panel of the Branding Editor, which you use to configure themes for your portal.
**Title and Logo**

**Portal title**
- Service Portal

**Logo**
- ![ServiceNow Logo](image)
- ![Upload an image](image)
- ![Delete](image)

**Logo Padding**
- **Left:**
- **Top:**

*Use title and logo to represent your brand across all pages of a portal*

**Tag Line and Background**
**SP Page Map widget**
The Page Map widget works in the Page Editor to display any Service Portal page in a tree structure.

![SP Page Map widget](image)

**Figure 610: SP Page Map widget**

**SP Portal Map widget**
The Portal Map widget displays your portal in a tree structure.

![SP Portal Map widget](image)

**Figure 611: SP Portal Map widget**

**Theme Preview widget**
The Theme Preview widget appears in the Branding Editor and allows you to see any theme changes you make to your portal.
Theme Preview

Navbar

Brand

- Default
- Primary
- Success
- Info
- Warning
- Danger
- Link

Text Primary - Nullam id dolor id nibh ultricies vehicula ut id elit.
Text Success - Duis mollis, est non commodo luctus, nisi erat porttitor ligula.
Text Info - Maecenas sed diam eget risus varius blandit sit amet non magna.
Text Warning - Etiam porta sem malesuada magna mollis euismod.
Text Danger - Donec ullamcorper nulla non metus auctor fringilla.
**Widget Edit Panel widget**

The Widget Edit Panel appears on the main page of the Widget Editor in Service Portal Configuration.

Use the Widget Edit Panel to view widgets that have recently been updated, create a widget, or view an existing widget.

![Widget Edit Panel](image)

**Figure 613: Widget Edit panel**

**Service Portal service status widgets**

Use the service status widgets to display current, planned, and historical outages for business services to your end users.

The service catalog widgets are part of the Service Portal Service Status [com.glide.service-portal.service-status] plugin, which is activated automatically with the Service Portal for Enterprise Service Management [com.glide.service-portal.esm] plugin.

**Business Service Status widget**

View how services are running on your system.
The Business Service Status widget pulls information from the cmdb_ci_service table. You can change where the data comes from in a cloned version of the widget by adjusting the settings in the widget server script.

Figure 614: Business Service Status widget
Instance options

![Image of Business Service Status widget instance options]

**Figure 615: Business Service Status widget instance options**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>Name of the widget. This only appears in the header for the widget instance options, it is not user-facing. To change the title for the list of services, clone and edit the widget HTML.</td>
</tr>
<tr>
<td>Glyph</td>
<td>Icon for the widget. This is not user-facing.</td>
</tr>
<tr>
<td>Number of Services</td>
<td>The number of services displayed in the widget. The default number is 250.</td>
</tr>
</tbody>
</table>

**Current Status widget**

The Current Status widget displays any issues reported in the system.

The Current Status widget checks the cmdb_ci_outage table to see if the system is experiencing any outages.
**Instance options**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Show outage details</td>
<td>Display details from the cmdb_ci_outage record</td>
</tr>
<tr>
<td>Standalone</td>
<td>Remove explanatory information. This also adds a link to more information.</td>
</tr>
</tbody>
</table>

**Planned Maintenance widget**

Describes any planned system maintenance.

The widget gathers information from the cmdb_ci_outage table. Any planned maintenance within the following five days appears in the Planned Maintenance widget.
The Planned Maintenance widget does not have any included instance options.

**Service History widget**
Displays the history of specific service’s status. For example, if the Bond Trading widget has a history of planned outages or degradations, the widget displays those with a varied color scheme to differentiate the outage type.
The Service History widget does not include any instance options.

*Service Status widget*

Service Status is a visual representation of service availability. Each colored pill correlates with a type of service availability, for example, orange represents service degradation.
The Service Status widget does not have any included instance options.

*Service Status Legend widget*
Use concurrently with the Status History widget to show what the icons in the Status History widget mean.

The Service Status Legend widget does not have any included instance options.

*Service Status Subscription widget*
Used in conjunction with the service status widget. Users subscribe to receive updates about the service status.
Instance options

The Service Status Subscription widget does not have any included instance options.

Widget instances

When you add a widget to a page using the Service Portal Designer, it creates a widget instance. A widget instance is a reference to a widget that contains a location, properties, and CSS specific to that instance. Adding the same widget multiple times to the same page creates multiple instances.

For example, the icon link widget displays as many different versions of itself as you add to a page.

Configure widget instance options

Each instance of the widget you configure remains unique, so you can have several instances of the same widgets on a page. For example, each instance of the cool clock widget on a page shows a different time zone. Configure a widget on a page by adjusting the instance options.
Role required: admin or sp_admin

Each time you add a widget to a page it creates a record on the sp_instance table with the following information:

- Reference to the column where the widget is located
- Reference to a widget
- Configuration for a widget in the form of pre-defined form fields and an Additional Options field in JSON format

1. On a page in the Service Portal Designer, point to the Edit icon in a widget to open the widget instance options. You can also access widget instance options using the control + right-click menu.

2. From the Instance Options window, make the selections you want to configure your widget. Instance options vary depending on which widget you select.
Figure 6: Configure widget instance options
Advanced users can configure the available options for a widget. For more information, see *Widget option schema* on page 2818.

**Widget context menu**

From any rendered Service Portal page you can CTRL+right-click a widget to see more configuration options in a context menu.

For example, navigate to Service Portal Service Portal Home to open a sample portal page. CTRL+right-click Knowledge Base on that page.

![Figure 625: Widget context menu](image-url)
Note: You must have the admin or sp_admin role to see the widget context menu. When you impersonate a user without one of those roles, you can still see the menu. However, a regular user signed in without those roles cannot see the menu.

### Table 1160: Widget context menu options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Widget performance</td>
<td>How long it takes for a widget to load</td>
</tr>
<tr>
<td>Instance options</td>
<td>Specify an instance of a widget. Widgets instance options vary depending on the widget you select. For example, the instance options for the cool clock widget include different time zones for each instance, so you can have the same clock four times on a page, but with all different time zones.</td>
</tr>
<tr>
<td>Instance in Page Editor</td>
<td>Opens that instance of the widget in the Page Editor</td>
</tr>
<tr>
<td>Page Designer</td>
<td>Opens the widget in the Service Portal Designer, which lets you add containers, columns, and widgets. You can add styling from the Service Portal Designer to your specific widget or to the page the widget lives on.</td>
</tr>
<tr>
<td>Edit Container Background</td>
<td>Make changes to the layout in which the widget is located.</td>
</tr>
<tr>
<td>Widget Options Schema</td>
<td>Define the actual options you can select for an instance of a widget. For more information on configuring your own instance options, see Widget option schema on page 2818.</td>
</tr>
<tr>
<td>Widget in Form Modal</td>
<td>Opens the widget form in a pop up window so you can make quick changes to the widget.</td>
</tr>
<tr>
<td>Widget in Editor</td>
<td>Opens the widget in the Widget Editor. You can use the Widget Editor to configure HTML templates, CSS, client scripts, service scripts, and demo data for the widget.</td>
</tr>
<tr>
<td>Log to console: $scope.data</td>
<td>The $scope.data object passes data from the server to the client side controller. Instead of adding console.log messages or alerts into the controller code, you can just log the $scope.data object to the browser console and view the data there.</td>
</tr>
<tr>
<td>Log to console: $scope</td>
<td>Similar to the $scope.data object, except it logs everything in $scope to the console.</td>
</tr>
</tbody>
</table>

**Widget developer guide**

Develop custom widgets in the Service Portal using AngularJS, Bootstrap, and the ServiceNow API.

**What to know before you begin**

To develop widgets, you need ServiceNow API experience to:

- Run record queries on the server.
- Create and update records.

You need AngularJS experience to:
• Bind variables to client controllers.
• Access server objects in a widget.
• Gather user input.

Optionally, you can build on the Bootstrap template by accessing Bootstrap components. Service Portal uses Bootstrap version 3.3.6.

**Parts of a widget**

Like Angular directives, widgets execute a specified behavior within a Service Portal page. A widget includes mandatory and optional scripting components.

**HTML template**

A mandatory widget component.

The HTML template requires knowledge of AngularJS to display and gather data. Use the HTML template to:

• Render the dynamic view that a user sees in the browser using information from the model and controller.
• Bind client script variables to your markup.
• Gather data from the end user.

**Client script**

A mandatory widget component.

A client script requires knowledge of both the ServiceNow API and AngularJS to create a client controller. Use the client script to:

• Map server data from JavaScript and JSON objects to client objects.
• Process data before rendering it.
• Pass data to the HTML template.
• Pass user input and data back to the server for processing.

**Server script**

A mandatory widget component.

A server script requires knowledge of the ServiceNow API to work with record data. Use the server script to:

• Set the initial state of the widget.
• Send record data to the widget client script using the data variable.
• Run server-side queries.

**Link function**

An optional widget component.

The link function requires knowledge of AngularJS. Use a link function to directly manipulate the DOM.

**Option schema**

An optional widget component.
Allows a Service Portal admin to configure a widget. Use the option schema to:

• Specify the parameters for a widget.
• Allow admin users to define instance options for a widget instance.
• Develop flexible, reusable widgets.

Angular Providers

An optional widget component.

Angular Providers require knowledge of AngularJS. Use Angular Providers to:

• Keep widgets in sync when changing records or filters.
• Share context between widgets.
• Maintain and persist state.
• Create reusable behaviors and UI components and inject them into multiple widgets.

Dependencies

An optional widget component.

A widget dependency is an external resource used by your widget such as JavaScript or CSS files.

Global objects in widgets

When a widget begins to render for the first time on a page, the server script executes first and accesses three global objects: input, options, and data. Because the input variable is a data object sent from the client script, this variable is undefined when first initialized.
When a widget is first instantiated, the server script:

1. Initializes an empty data object.
2. Initializes the input object with any data sent from the client controller, or the options object with any data used to initialize the widget.
3. Sends the data object to the client controller as JSON.

The client script:

1. Accesses the server data object using c.data.

   **Note:** By default, widgets use the c variable to represent the controller instance using controller as syntax. You can change this variable when creating or cloning widgets.

2. Uses server.update() to post changes to the data model. This method updates the server script using the input object.

   **Note:** After calling server.update(), the client script data object is automatically overwritten by the server script data object.

3. Uses c.options to access the values used to invoke the widget on the server. This object is read-only.
Using the Widget Editor

When you create a widget, a record is created in the sp_widget table. However, you can use the Widget Editor in Service Portal Configuration as your scripting environment. The Widget Editor is a full page application similar to an IDE. You can show the parts of the widget you want to edit and hide the rest, while previewing your changes in real time.

```html
<div>$ {Symbol Lookup} : <input ng-model="c.data.symbol" ></div>
<p>$ {Stock Price} : <span ng-if="!c.data.price"></span></p>
<img ng-src="http://chart.finance.yahoo.com/chart" ng-repeat="r in c.data" ng-init="r.price = r.data.price;">
```
Recommendations for developing widgets

When developing custom widgets, keep these recommendations in mind for optimal performance, scalable development, and a good user experience.

**Create a default state that provides an example to the end user**

A widget does not have instance options defined when initially added to a page. A widget in this empty state can appear blank and cause confusion. In situations where a widget requires some initial configuration, ensure that your widget has a default state that communicates to the admin what configuration is necessary.

Widgets can also be created with demo data. Demo data can also be used to:

- Clearly demonstrate the widget functionality to the user.
- Provide data when previewing the widget in the widget editor. (Demo data is not visible in the designer).

Learn more: Tutorial: Build a custom widget on page 2839.

**Embed a widget rather than clone when possible**

Embedding an existing widget into your custom widget takes advantage of pre-existing functionality without cloning or duplicating code. You can still pass parameters into the embedded widget to control its behavior.

Learn more: Embed an existing widget on page 2845

**Add limits to GlideRecord queries to improve performance**

If your server-side script uses GlideRecord queries, the setLimit function can restrict the number of records returned, and improve response time on queries. For added flexibility, you can tie this limit to an instance option rather than assigning a hard-coded value (for example: gr.setLimit(options.limit || 100)).

Learn more: GlideRecord setLimit Function

**Create a directive instead of embedding a complex widget**

When an embedded widget is called from the server, all the scripts associated with that widget are returned. If you only need a subsection of a widget, embedding the entire widget creates unnecessary overhead. Instead, use directives to share lightweight code between widgets. Directives are useful, for example, when building UI components. Complex components with server-side and client-side functionality are best left as widgets. Use a directive instead of an embedded widget to:

- Share scope or custom scope behavior with multiple widgets.
• Share a reusable, lightweight subsection of a widget.
• Share a common UI feature, such as a list or an avatar.
• Augment widget behavior.

Learn more: *Reuse components with Angular Providers* on page 2824.

**Use a service or factory to share data and persist state**

Data services and factories maintain and persist state in a widget without requiring multiple calls to the server, enabling you to:

• Keep widgets synchronized when changing records or filters.
• Share data between widgets.
• Develop more performant widgets.

Learn more: *Reuse components with Angular Providers* on page 2824.

**Handle events with a publish/subscribe service**

Avoid using `$broadcast` in the DOM. `$broadcast` dispatches the event name to all child scopes notifying registered listeners, which can be an expensive call that requires the use of the `$rootScope` global object.

Instead, use a publish/subscribe service to handle events. When using a publish/subscribe service, a clear relationship forms between your widgets through callback handlers. In this model, you can better control the state of your events.

**Use REST calls or server.get to fetch data from the server**

When you call server.update(), the entire widget is returned from the server. If your widget includes divergent code paths, multiple calls to update the server can affect performance. As a rule, use your server script to set up the initial state of your widget. For subsequent updates, use scripted REST APIs that call script includes on your instance. This practice:

• Separates business logic from UI elements.
• Centralizes your code, allowing changes to be made in one place.

You can also use server.get to pass information to the server. Use this function along with input.action to execute specific parts of the server script.

**Develop with localization, accessibility, and UI in mind**

To create the best experience for your users, follow these guidelines:

• Consider the impact of your widget in a mobile environment. For example, avoid using mouse-over and other events that do not translate to a mobile device.
Clone a widget

Take advantage of existing code by cloning and editing an existing widget.

Role required: admin or sp_admin

**Note:** Base system widgets are read only so you can benefit from future updates. To make changes, you can clone base system widgets. However, cloned widgets are considered custom and do not benefit from future updates to the widgets they were cloned from.

1. Open the Widget Editor in the Service Portal Configuration page, then select an existing widget from the Select a widget list. For example, select Hello World 2.
2. From the list menu in the widget header, click Clone “Hello World 2”.

![Clone Widget](image)

**Figure 626: Clone a widget**

3. Enter a name for the cloned widget. The widget ID is created automatically based on the widget name.
4. Select Create test page to automatically create a page containing the widget.
5. Use the check boxes to show or hide the different components of the widget editor as needed. Make changes to the HTML Template, CSS, client script, server script, or the link function.
¡Hola, mundo!
6. In order to enable a preview of your widget, use Enable Preview from the menu. Use the eye icon that appears to show or hide a preview of your widget.

If you clone a widget that uses the Angular ng-template, you must manually clone the template and change the name of the template reference in the widget.

For example, the header menu widget uses the Angular ng-template menuTemplate. If you clone the header menu widget, you must also clone the menuTemplate and give the clone a unique name. When you open the clone of the header menu widget, you can see a reference to the menuTemplate in the HTML.

![menuTemplate in header widget HTML](image)

**Figure 628: menuTemplate in header widget HTML**

Create a new widget

Create a new widget to build a custom widget from scratch.

Role required: admin or sp_admin

1. Navigate to Service Portal Service Portal Configuration Widget Editor.
2. Click Create a new widget.
3. Enter a name for the new widget. The widget ID is created automatically based on the widget name. Optionally select Create test page to automatically create a page containing the widget.
Add a Widget

My widget

my_widget

Use only lowercase letters, numbers, underscores, and hyphens

Create test page

Submit

**Note:** After completing development of a widget with a test page, delete the test page. Maintaining test pages can create clutter when managing pages.

4. Click Submit.

The widget HTML template, client script, and server script display in the widget editor. Basic script templates are included as a guide.
Widget option schema

Widget instances allow users to uniquely configure each widget they add to a page. Use the option schema to define the parameters for your widget.

Storing instance options

When developing a widget, you can edit the option schema to create parameters for your widget, or you can create a table to store instance options. If you edit the existing option schema, any instance options defined are stored in JSON format in the Additional options, JSON format field in the sp_instance table. The following field types are available:

- String
- Boolean
- Integer
- Reference
- Choice
- Field_list (depends on table)
- Field_name (depends on table)
• Glide_list

To use other field types not supported in the option schema, create an extension table to store your custom widget option schema. Using a table enables you to:
• Add any ServiceNow field type, including fields with advanced customization, to the option schema.
• Define a complex option schema.
• Search and filter instance options.

**Note:** While storing options in a table enables you to define more complex options, this method is more difficult to maintain than editing the option schema. To avoid creating unnecessary tables and adding additional server calls to your widget, edit the existing option schema when possible. Store options in a table only when complex or searchable options are required.

### Using options in a widget

Access options in the widget from both the client script and the server script using the options global variable. You can access to any option value in your widget client script or server script using options.optionName.

**Client script**

```javascript
function() {
    /* widget controller */
    var c = this;
    console.log(c.options.text_color) //Outputs the text_color option for this instance
}
```

**Server script**

```javascript
(function() {
    $sp.log(options.text_color) //Logs the value of the text_color option to the browser console.
})(());
```

### Defining default options

Before an option value is set on an instance, it appears as an undefined value when you access that option variable. Use the widget server script to specify default values for your options.

```javascript
(function() {
    options.text_color=options.text_color||"blue";
    options.maximum_entry_count=options.maximum_entry_count||5;
})
```

**Edit the widget option schema**

Widget instances allow users to uniquely configure each widget they add to a page. Edit the option schema to define basic parameters for your widget.

**Role required:** admin or sp_admin

1. Navigate to Service Portal Service Portal Configuration Widget Editor.
2. Select the widget you want to configure the option schema for.
3. Click the menu icon (📖) and select Edit option schema.
   - This option only appears for users that have the right to edit the widget.
4. Click + to add a widget option.
5. Define a label, name, type, hint and form section. More fields appear depending on the type you select.

Adding flexible widget options allows you to create more reusable widgets. You can add default values to help users understand each widget option. If you do not select a form section, the default is set to Other options.
6. Click Save. The option schema you defined is stored in JSON format in the Option schema field in the sp_widget table. Based on this option schema, each instance of the widget can use individually defined instance options.
7. Test the option schema by adding the widget to a page in the Service Portal Designer.
   a) Navigate to Service Portal Service Portal Configuration Service Portal Designer.
   b) Add the widget to a page and click the edit icon on the widget instance to view the instance options.
   c) **Configure the widget instance options.**
   d) View the configuration by navigating to the instance record in the sp_instance table. The instance options are stored in JSON format in the Additional options, JSON format field.

**Store instance options in a table**

Create a table to store widget instance options instead of editing the existing option schema. When using a table as your widget option schema, you can define custom fields using any ServiceNow field type, add filters to fields, and search or query instance options.

Role required: admin or sp_admin

To define a custom option schema, add fields to an sp_instance extension table, then set your widget to use the extension table as a data source. Using an extension table enables you to:

- Add any ServiceNow field type, including fields with advanced customization, to the option schema.
- Define complex widget options.
- Search and filter instance options.

**Note:** While storing options in a table enables you to define more complex options, this method is more difficult to maintain than editing the option schema. To avoid creating unnecessary tables and adding additional server calls to your widget, edit the existing option schema when possible. Store options in a table only when complex or searchable options are required.

1. Create a table that extends an sp_instance table to store your custom option schema.
   a) Navigate to System Definition Tables.
   b) Click New.
   c) Define a label and name.
   d) In the Extends table field, select an sp_instance table that provides the necessary fields.

<table>
<thead>
<tr>
<th>Instance table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instance [sp_instance]</td>
<td>Includes base instance fields.</td>
</tr>
<tr>
<td>Instance with Table [sp_instance_table]</td>
<td>Includes sp_instance fields and fields to display table data such as Table and Filter.</td>
</tr>
</tbody>
</table>

   e) Save the form.

2. Define custom fields in the extension table.
   You can define any field type to use in your option schema by adding new columns in the Columns list.

3. Update your widget to use the extension table as a data source.
   a) Navigate to Service Portal Widgets.
   b) Open the widget you would like to create custom options for.
   c) In the Data table field, select your sp_instance extension table.
4. Configure the extension table form to display the desired fields. Fields configured on the form are available as instance options.
   a) Navigate to the extension table form: `<yourInstance>/<your_extension_table>.do`.
   b) Right-click the header menu and select Configure Form Layout.
   c) Add the fields to the form.
   d) Click Save.

5. Configure the widget to display the desired fields as instance options.
   a) Navigate to Service Portal Widgets.
   b) Open the widget that has the extension table set as the data source.
   c) Use the Fields slushbucket to select fields to display as instance options.
d) Save the form.

Test the option schema by adding the widget to a page in the Service Portal Designer. Click the edit icon on the widget instance to view the instance options. After configuring the widget instance options, view the configuration by navigating to the instance record in the sp_instance extension table.

Reuse components with Angular Providers

Angular Providers are reusable components that can be injected into multiple widgets. To ensure quick loading widgets and a high performing portal, create Angular Providers instead of overloading your client controllers with persistent data and additional logic. With Angular Providers, you can maintain data for the lifetime of your Service Portal and reuse components and data objects across multiple widgets.

Role required: admin or sp_admin

By creating an Angular Provider, you can:

- Keep widgets in sync when changing records or filters.
- Share context between widgets.
- Maintain and persist state.
- Create behaviors and inject them into multiple widgets.

To learn more, visit Angular Providers.

   The Widget Angular Providers table opens.
2. Click New to create a new record.
3. Select the type of Angular Provider.
   - Directive
   - Factory
   - Service

To facilitate migration to ECMAScript 6 in the future, consider using services over factories.

4. Define a name.
   You will use the name to associate the Provider with your widget.

5. Add a script in the Client Script field.

   A basic factory that formats a number in US currency.

   ```javascript
   function formatterFactory(){
     var myVal = Number;
     return {
       format: function(myVal) {
   ```
6. Associate the Angular Provider with a widget.
   a) Navigate to <yourInstanceURL>/sp_config?id=widget_edit.
   b) Open the widget you would like to associate with the Angular Provider.
   c) Under Related Lists, select Angular Providers.
   d) In the Angular Providers list, click New.
   e) In the Angular Provider field, select the appropriate Provider. Check the Widget field to ensure that you are associating the Angular Provider with the correct widget.

   ![New Angular Providers](image)

   f) Click Save.

7. Update the appropriate scripts in your widget to inject the Angular Provider into the widget.

   Inject the factory into your widget client script by passing the name of the factory as an argument in your client controller function. You can then access the object defined in the factory function in your widget client script.
function(formatterFactory) {
  /* widget controller */
  var c = this;
  console.log(formatterFactory.format(300));
}

If defining a directive, use the directive in the widget HTML template.

8. To edit the Angular Provider after it is registered with your widget, open the Angular Provider client script in the widget editor.
   a) Navigate to Service Portal Configuration Widget Editor.
   b) Under Edit an existing widget, select the widget associated with your Angular Provider.
   c) In the Show menu, open the Dependencies list and select the Angular Provider.

   ![Dependencies](image)

   **Note:** Only Angular Providers associated with the widget are displayed in the Dependencies list. This list includes any external resources your widget depends on.

   The Angular Provider client script displays in the widget editor. In the widget editor interface, you can edit and save your widget and Provider scripts at the same time.

To use an Angular Provider with multiple widgets, register your Provider with each widget and update the appropriate scripts.

**Embedded widgets**

Embed a widget in the HTML template, server script, or client script.

**Embed a widget in an HTML template**

Use the `<widget></widget>` element to embed a widget in an HTML template. Pass in the ID of the widget you are trying to embed as a parameter.

```html
<widget id="widget-cool-clock"></widget>
```

If a widget has an option schema, you can define instance options in JSON format.

```html
<widget id="widget-cool-clock" options='{"zone": "America/Los_Angeles","title": "San Diego, CA"}'></widget>
```

Alternatively, you can define options in the widget server script.

**HTML template**

```html
<widget id="widget-cool-clock" options='data.clockOptions'></widget>
```

**Server script**

```javascript
(function() {
  data.clockOptions = {
    "zone": "America/Los_Angeles","title": "San Diego, CA"};
});
```
**Embed a widget in a client script**

Use `spUtil.get()` to get a widget model in the client script.

```javascript
spUtil.get("widget-sc-cat-item", {sys_id: 
"your_catalog_item_sys_id"}).then(function(response) {
    c.catalogItemWidget = response;
});
```

When using the `spUtil` class in a widget client script, you must inject the class into the client script function. The following example embeds the Cool Clock widget:

**Client script**

```javascript
function(spUtil) {
    var c = this;
    spUtil.get("widget-cool-clock").then(function(response) {
        c.myClockWidget = response;
    });
}
```

**HTML template**

```html
<sp-widget widget="c.myClockWidget"></sp-widget>
```

**Embed a widget in a server script**

Use `$sp.getWidget()` to get a widget model in the server script.

```javascript
data.catalogItemWidget = $sp.getWidget("widget-sc-cat-item");
```

The following example embeds the Cool Clock widget:

**Server script**

```javascript
(function() {
    var coolClockOptions = {
        "zone": "America/Los_Angeles", 
        "title": "San Diego, CA"
    }
    data.coolClockWidget = $sp.getWidget('widget-cool-clock', coolClockOptions);
})();
```

**HTML template**

```html
<sp-widget widget="data.coolClockWidget"></sp-widget>
```

**Widget model properties**

When a widget model is called from within another widget, the HTML template, client script, and link function are loaded just as they are in the `sp_widget` record. The data property is the result of the widget server script execution. Anything that you put on the data object on the server is available in the data object on the client.

<table>
<thead>
<tr>
<th>Property name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>client_script</td>
<td>string</td>
<td>Widget client script field.</td>
</tr>
<tr>
<td>Property name</td>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>--------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>css</td>
<td>string</td>
<td>Compiled CSS output from the SASS field for the widget.</td>
</tr>
<tr>
<td>data</td>
<td>object</td>
<td>Data object containing keys and values from the widget server script.</td>
</tr>
<tr>
<td>dependencies</td>
<td>array</td>
<td>Any third-party libraries to load before the widget executes.</td>
</tr>
<tr>
<td>options</td>
<td>object</td>
<td>Options used to initialize the widget.</td>
</tr>
<tr>
<td>template</td>
<td>string</td>
<td>HTML template field for the widget.</td>
</tr>
</tbody>
</table>

Embed a widget multiple times with custom options
Embed the cool clock widget multiple times using custom options.

Role required: admin or sp_admin
Create a widget that embeds multiple instances of the cool clock widget, each with a different time zone and title. Open the cool clock widget in the Widget Editor to see widget options referenced in the HTML template and the Client Script.
Figure 629: Cool Clock widget with Options highlighted

1. Clone the Cool Clock widget with the name Embedded clock.
2. Replace the code blocks with the following:

   HTML Template

   ```html
   1. <div class="clock">
   2.   <div class="square">
   3.     <svg viewBox="0 0 100 100">
   4.       <g transform="translate(50, 50)" class="({options.color})">
   5.         <circle class="clock-face" r="48"/>
   6.         <line ng-repeat="minor in c.options.tracks by $index" class="nine">
   7.           y1="42" y2="45" ng-attr-transform="rotate(360 / $index / c.options.majors)"
   8.         </line>
   9.         <line ng-repeat="major in c.options.tracks by $index" class="maj">
   10.           y1="35" y2="40" ng-attr-transform="rotate(360 / $index / c.options.majors)"
   11.         </line>
   12.         <line class="hour" y1="2" y2="-20">
   13.           ng-attr-transform="rotate((30 * c.options.hours) + c.options.minutes)"
   14.         </line>
   15.         <line class="minute" y1="14" y2="-30">
   16.           ng-attr-transform="rotate((60 * c.options.minutes) + c.options.seconds)"
   17.         </line>
   18.         <line stroke="({options.color})" class="second" y="18">
   19.         </line>
   20.     </svg>
   21. </div>
   22. <div class="text-center text-muted m-3 mr-3" 3>{{options.title}}</div></div>
   ```

   Client Script

   ```javascript
   1. function (timeout) {
   2.   var c = this;
   3.   c.darkness = "";
   4.   if (c.options.c_color || c.options.c_color.length)
   5.     c.options.c_color = "red";
   6.   var x = c.options.zone || "America/Los_Angeles";
   7.   c.date = moment().tz(x);
   8.   c.majors = new Array(12);
   9.   c.minors = new Array(60);
   10.  function tick() {
   11.    c.date = new moment().tz(x);
   12.    if (c.date.hours() % 15) var t = c.date.hours();
   13.    c.darkness = "";
   14.    if (t > 17) c.darkness = "evening";
   15.    if (t > 19) c.darkness = "night";
   16.    if (t < 5) c.darkness = "night";
   17.    if (timeout(tick, 1000))
   18.    };
   19. })();
   ```
<div class="panel panel-default">
  <div class="panel-heading">Time across the US</div>
  <div class="panel-body">
    <div class="row">
      <div class="col-sm-3" ng-repeat="myClock in c.data.clocks">
        <sp-widget widget="myClock"></sp-widget>
      </div>
    </div>
  </div>
</div>

CSS
.
  .panel {
    margin-top: 10px;
  }

Client Script
function() {
    // nothing to do here...
}

Server Script
(function() {
    var options = [
      {zone: "America/Los_Angeles", title: "San Diego"},
      {zone: "America/Denver", title: "Denver"},
      {zone: "America/Chicago", title: "Chicago"},
      {zone: "America/New_York", title: "New York"}
    ];

    data.clocks = [];
    for (var i in options) {
      data.clocks.push($sp.getWidget("widget-cool-clock", options[i]));
    }
})();

Each instance of the clock in the embedded clock widget appears with a different time zone.
Create a widget dependency

In Service Portal, you can link JavaScript and CSS files to widgets to create dependencies between widgets and third-party libraries, external style sheets, and angular modules.

Role required: admin or sp_admin

Dependencies are loaded asynchronously from the server when needed.

Widgets can have as many or as few dependencies as needed. However, the more you add, the more content a widget must download to render on the page. Keep dependencies as small as possible for more efficient load times.

1. Create a dependency package.

   A dependency package is a collection of Javascript and CSS files that can be then connected to a widget.

   a) Navigate to Service Portal Dependencies.

   b) In the dependency record, define the following fields.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The name of your dependency. (Useful for selecting a dependency from a dropdown list)</td>
</tr>
<tr>
<td>Application</td>
<td>Application scope for the dependency record.</td>
</tr>
<tr>
<td>Include on page load</td>
<td>Select if you want your dependency to be loaded onto the page on initial page load of Service Portal, or leave unchecked to load the dependency only when the linked widget is loaded onto a page.</td>
</tr>
</tbody>
</table>
2. **Add files to the dependency package**

   After you save the information for your dependency package, use the related lists to add JS and CSS Include files. For each related list, include the following information:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angular module name</td>
<td>Optional. Define the value if the linked JavaScript is an Angular module. Provide the name of the Angular module being loaded, so that it can be injected into the Service Portal Angular application.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display name</td>
<td>Name of the script include.</td>
</tr>
</tbody>
</table>
   | Source         | Depending on whether you add a JS Include or a CSS Include, select one of these options from the list:  
                   • URL  
                   • UI script (for a JS Include) or Style Sheet (for a CSS Include)  
                   For a JS Include, use the UI Script field to reference a UI Script found in System UI UI Scripts.  
                   For the CSS Include, use the Style Sheet field to reference a record in the sp_css table. |

3. **Add a dependency package to a widget**

   After you have created a dependency package and added files, create a relationship between the dependency and a widget.

   a) Navigate to Service Portal Widgets and find the widget record you want to add the dependency to.
   
   b) From the Dependencies related list, click Edit.
   
   c) In the slushbucket, find the dependency you created and double-click to add it to the selected items column on the right. Save the page to return to the widget record.

---

*Include a font icon in a single widget*

If you only want one widget to have access to a font icon, include the font icon in a single widget.

**Role required:** admin or sp_admin

Adding an icon to a specific widget keeps the icon scoped and prevents it from interfering with other CSS on the page.

1. In the platform UI, navigate to Service Portal Widgets, then click the widget you want to add an icon to.

2. Attach the individual icon file to the widget record.

3. In the HTML template, include something like the following:

   ```html
   <div>
     <i class='font-family'>icon_name</i> you did it!
   </div>
   ```
Make sure the class is exactly the same as the font family called out in the CSS. For example `<i class='material-icons'>` should be the same as the `.material-icons` included in the CSS. The `icon_name` should match the name of the file you attached.

4. In the CSS field for the widget, add the CSS for the font-icon definition. Most font-icon sets include a CSS file similar to the material icons one used below. Use the `sys_id` of the attachment as the `src` in the CSS.
An icon that you can select in the widget or widget instance.

To use custom font-icons across widgets, add the icon to a page or make it a widget dependency.
Include font icons as a widget dependency
You can include font icons wherever a widget is loaded by including them as a widget dependency.

Role required: admin or sp_admin

Note: CSS included as a widget dependency is not scoped and can disrupt other CSS on a page.

1. In the platform UI, navigate to Service Portal CSS and create a new style sheet.
2. Attach the font-icon set to the sp_css record you created, and use the sys_id of the attachment as the src for the font icon.
3. Navigate to Service Portal Dependencies and create a new dependency.
4. Attach the CSS record you created to the new dependency using the CSS Includes related list.
Internationalize a widget

Use the ${} or gs.getMessage() syntax in widgets to tag strings for translation so you can localize your Service Portal content.

The ${} or gs.getMessage() searches in the messages table [sys_ui_message] in the platform to see what the translation would be.

Use the HTML template to internationalize strings in a widget. Type the following in an HTML template.
Writing text as ${message} is the equivalent of writing ${gs.getMessage("message")} in other parts of the system, but written as a more legible shorthand.

**Note:** In some cases, the translation might have quotes or double quotes on it. That could lead to JavaScript errors if you are using the ${} syntax in the client script. The safest way to fetch a translated message is to do it in the server script. Then, assign the value to a client-side Angular binding.

### Translating strings in the client script

```javascript
function() {
  var c = this;
  c.message = "${This message will be internationalized}";
}
```

**HTML template:**

```html
<div>
  <!-- The output of this text will be internationalized. -->
  <p>{{c.message}}</p>
</div>
```

### Translating strings in the server script

Use the server script to translate schema options and other values during server-side runtime.

```javascript
function() {
  data.message = gs.getMessage("this message contains 'quotes'");
  // You can also translate schema options using the server script
  // For example, data.message = gs.getMessage(options.title);
}
```

**HTML template**

```html
<div>
  <p>{{c.data.message}}</p>
</div>
```

### Tutorial: Build a custom widget

Follow this tutorial to build a custom widget that displays Service Catalog items. Use this tutorial as a model to help you understand the advanced scripting power of the Service Portal.

In this tutorial, you will create the Quick Order widget. This widget:

- Displays popular items to the user prior to any search.
- Queries the Service Catalog and displays available options to the user.
- Includes an embedded SC Catalog Item widget, allowing the user to view and order items within the Quick Order widget.
- Uses an Angular Provider to display a category icon beside each queried item.

*Create a widget and set up a template*

Create the Quick Order widget to query items in the Service Catalog.
Role required: admin or sp_admin

1. Navigate to Service Portal Service Portal Configuration and click Widget Editor.
2. Click Create a new widget.

3. Define the following values.
   - Widget Name: Quick Order
   - Widget ID: quick_order
   - Create a test page: Active
   - Page ID: quick_order

Adding a widget to a test page creates a record in each of the following tables:
   - sp_page
   - sp_container
   - sp_row
   - sp_column
• sp_instance
• sp_widget

Note: You can use the Page Editor in Service Portal Configuration to view the hierarchy of elements on your test page.

4. Click Submit.
5. From the Widget Editor, open the Quick Order widget.
6. Add the following simple template to the HTML field.

```html
<div class="panel panel-primary">
  <div class="panel-heading">Request an item from the catalog</div>
  <div class="panel-body">
    My catalog results
  </div>
</div>
```

7. Click Save.
8. Preview your test page in a new tab using the following URL: <yourInstanceUrl>/sp?id=quick_order.

Your widget template displays on the test page.

Add a server script to query an instance table
After adding your widget and creating a basic template, you can define more advanced scripts that enable the user to query data from an instance table. Using client and server scripts, you can pass the data model between the client and server by querying data from the database, displaying it to the user, and sending any updates back to the server.

Role required: admin or sp_admin

1. From the Widget Editor, open the Quick Order widget.
2. Select Server Script to open the server script field.
3. Replace the default server script with the following custom script.

```javascript
(function() {
  if (input.keywords != null && input.keywords != '')
    data.items = getCatalogItems(input.keywords);

  function getCatalogItems(keywords) {
    var sc = new GlideRecord('sc_cat_item');
    sc.addActiveQuery();
    sc.addQuery('123TEXTQUERY321', keywords);
    sc.addQuery('sys_class_name', 'NOT IN', 'sc_cat_item_wizard,sc_cat_item_content');
    sc.addQuery('sc_catalogs', '0d08b13c3330100c8b837659bba8fb4');
    sc.setLimit(100);
    sc.orderByDesc("ir_query_score");
    sc.query();
    var results = [];
    while (sc.next()) {
      if (!$sp.canReadRecord(sc))
        continue;

      var item = {};
      $sp.getRecordDisplayValues(item, sc, 'name,price,sys_id');
      results.push(item);
    }
    return results;
  }

  $sp.getDisplayValue('results', results);
}
```

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item.category = sc.getValue('category');
    results.push(item);
}
return results;
})();

This script performs a keyword search on the sc_cat_item table using the 123TEXTQUERY321 query method.

4. Replace the HTML template with the following script:

```html
<div class="panel panel-primary">
    <div class="panel-heading">Request an item from the catalog</div>
    <div class="panel-body">
        <input class="form-control" type="search" placeholder="Start typing here to search the list of catalog items" ng-model="c.data.keywords" ng-change="c.server.update()" ng-model-options="{debounce: 250}" />
        <ul class="list-group result-container">
            <li class="list-group-item" ng-repeat="item in c.data.items">
                <a href>{{item.name}}</a><span class="pull-right">{{item.price}}</span>
            </li>
        </ul>
    </div>
</div>
```

This template adds a search field and displays the results of the query performed in the server script using the following Angular directives. To learn more about these directives, review the Angular API Reference.

Table 1161: Angular directives used in the template

<table>
<thead>
<tr>
<th>Angular directive</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ng-model</td>
<td>Automatically reads and writes value changes to the model variable c.data.keywords.</td>
</tr>
<tr>
<td>ng-model-options</td>
<td>Configures ng-model behavior. In this template, ng-model updates the model after a user has stopped typing for 250 milliseconds.</td>
</tr>
<tr>
<td>ng-change</td>
<td>Executes c.server.update() after the model value changes. This function posts the data object to the server script. After the script is executed, the data object is automatically updated with the new values from the server generated data object.</td>
</tr>
<tr>
<td>ng-repeat</td>
<td>Creates a template from the parent element and child elements. For each item in c.data.items, an instance of the template is created and the expressions {{item.name}} and {{item.price}} are replaced with the values from each item.</td>
</tr>
</tbody>
</table>

5. Add the following script to the CSS - SCSS field:

```css
.result-container {
    margin-top: 10px;
}
```

6. Refresh your test page preview to view the changes.

As you type in the search box, matching catalog items appear. Try searching for ipad.
Manage the empty state of a widget
Display a list of popular items to the user before any search terms are entered.

Role required: admin or sp_admin

Because no search has been executed when the widget initializes, the server input variable is undefined. This empty state may cause confusion when a user first interacts with the widget. To solve this issue, give your widget something to display when the input variable is empty. This initial data can guide your users when initially interacting with your widget.

1. From the Widget Editor, open the Quick Order widget.
2. Replace the existing server script with the following script:

   ```javascript
   (function() {
     if (input.keywords != null && input.keywords != '')
       data.items = getCatalogItems(input.keywords);
     else data.items = getPopularItems();

     function getCatalogItems(keywords) {
       var sc = new GlideRecord('sc_cat_item');
       sc.addActiveQuery();
       sc.addQuery('123TEXTQUERY321', keywords);
       sc.addQuery('sys_class_name', 'NOT IN',
           'sc_cat_item_wizard,sc_cat_item_content');
       sc.addQuery('sc_catalogs', '0d08b13c3330100c8b837659bba8fb4');
       sc.setLimit(100);
       sc.orderByDesc('ir_query_score');
       sc.query();
       var results = [];
       while (sc.next()) {
         if (!$sp.canReadRecord(sc))
           continue;

         var item = {};
         $sp.getRecordDisplayValues(item, sc, 'name,price,sys_id');
         item.category = sc.getValue('category');
         results.push(item);
       }
       return results;
     }

     function getPopularItems() {
       var items = [];
       var count = new GlideAggregate('sc_req_item');
       count.addAggregate('COUNT', 'cat_item');
       count.groupBy('cat_item');
   ```

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count.addQuery('cat_item.sys_class_name', 'NOT IN', 'sc_cat_item_guide,sc_cat_item_wizard,sc_cat_item_content');
count.addQuery('cat_item.sc_catalogs', '0d08b13c3330100c8b837659bba8fb4');
count.orderByAggregate('COUNT', 'cat_item');
count.query();
while (count.next() && items.length < 9) {
    if (!$sp.canReadRecord("sc_cat_item", count.cat_item.sys_id.getDisplayValue()))
        continue; // user does not have permission to see this item
    var item = {};
    item.name = count.cat_item.name.getDisplayValue();
    item.category = count.cat_item.category.toString();
    item.price = count.cat_item.price.getDisplayValue();
    item.sys_id = count.cat_item.sys_id.getDisplayValue();
    items.push(item);
}
return items;
})();

This script introduces a new function getPopularItems() to query the database and return popular items when the input variable is empty.

3. Replace the HTML template with the following script:

```html
<div class="panel panel-primary">
  <div class="panel-heading">Request an item from the catalog</div>
  <div class="panel-body">
    <input class="form-control" type="search" placeholder="Start typing here to search the list of catalog items" ng-model="c.data.keywords" ng-change="c.server.update()" ng-model-options="{debounce: 250}" />
    <h5 ng-if="!c.data.keywords">Showing the most popular items</h5>
    <ul class="list-group result-container">
      <li class="list-group-item" ng-repeat="item in c.data.items">
        <a href="{{item.name}}">{{item.name}}</a><span class="pull-right">{{item.price}}</span>
      </li>
    </ul>
  </div>
  <div class="panel-footer" ng-if="c.data.keywords">
    <ng-pluralize count="c.data.items.length" when="{'0': 'No items found for ', '1': 'One item matching ', 'other': 'Found {} items matching '}">
      {{c.data.keywords}}
    </ng-pluralize>
  </div>
</div>
```

This script provides a template to display the popular items returned from the server script.

4. Refresh your test page preview to view the changes.

The widget displays popular items to the user prior to any search input.
Embed an existing widget

Enable the user to view and purchase Service Catalog items in the Quick Order widget by embedding the SC Catalog Item widget.

Role required: admin or sp_admin

Instead of duplicating code, you can embed widgets to leverage pre-existing functionality. The SC Catalog Item widget is a base system widget that enables the user to view and purchase Service Catalog items.

1. Inspect the SC Catalog Item widget.
   Before embedding the SC Catalog Item widget, inspect the widget to understand what data it needs access to. You may need to update your Quick Order widget client or server script to make sure that the correct data is passed to the embedded widget.
   a) Navigate to <yourInstanceURL>/sp_config?id=widget_edit.
   b) Open the SC Catalog Item widget.
   c) Note that the widget ID is widget-sc-cat-item. You will use this ID to embed the widget model in the client script.
   d) Examine the server script.

   Notice that the data object includes a sys_id property populated by either the input or options objects. If neither input nor options include a sys_id, the $sp.getParameter() method retrieves the sys_id from the request query string.
To populate the input object, you can pass a catalog item sys_id from the Quick Order widget client script.

2. From the Widget Editor, open the Quick Order widget.
3. Replace the Quick Order widget client script with the following script.

```javascript
function($location, spUtil) {
  var c = this;

  c.select = function(item_id) {
    if (c.openItem == item_id) {
      c.openItem = null;
      return;
    }
  }

  renderCatalogItemWidget(item_id);
}
```
function renderCatalogItemWidget(item_id) {
    c.catalogItemWidget = null;
    spUtil.get("widget-sc-cat-item", {sys_id:
        item_id}).then(function(response){
        c.catalogItemWidget = response;
        c.openItem = item_id;
    });
}

This script uses spUtil.get() to retrieve the widget model by ID (widget-sc-cat-item) and define the
{sys_id: item_id} object. This object posts to the server script as input.

4. Replace the HTML template with the following script:

   <div class="panel panel-primary">
       <div class="panel-heading">Request an item from the catalog</div>
       <div class="panel-body">
           <input class="form-control" type="search" placeholder="Start typing
here to search the list of catalog items" ng-model="c.data.keywords" ng-
change="c.server.update()" ng-model-options="{debounce: 250}" />
           <h5 ng-if="!c.data.keywords">Showing the most popular items</h5>
           <ul class="list-group result-container">
               <li class="list-group-item" ng-repeat="item in c.data.items">
                   <a href ng-click="c.select(item.sys_id)">{{item.name}}</a><span
                       class="pull-right">{{item.price}}</span>
                   <div class="catalog-item" ng-if="item.sys_id == c.openItem">
                       <sp-widget ng-if="c.catalogItemWidget"
                           widget="c.catalogItemWidget" />
                   </div>
               </li>
           </ul>
           <div class="panel-footer" ng-if="c.data.keywords">
               <ng-pluralize count="c.data.items.length"
                   when="{'0': 'No items found for ',
                       '1': 'One item matching ',
                       'other': 'Found {} items matching '}">
                   {{c.data.keywords}}
               </ng-pluralize>
           </div>
       </div>
   </div>

This template:
   • Adds on-click behavior using the ng-click directive.
   • Displays the embedded SC Catalog Item widget using the sp-widget directive.

5. Replace the CSS with the following script:

   .result-container {
       margin-top: 10px;
   }
   .catalog-item {
       background-color: #f5f5f5;
       padding: 10px;
       @include border-top-radius($panel-border-radius);
       @include border-bottom-radius($panel-border-radius);
   }

6. Refresh your test page preview to view the changes.

When you select a search result, the item opens in the embedded SC Catalog Item widget.
Create a reusable directive and add it to a widget
Angular Providers are reusable components that can be added to multiple widgets. Using the Widget Angular Providers table, create a directive that shows a category icon next to each result in the Quick Order widget.

Role required: admin or sp_admin

Angular Providers let you build angular directives and services that can be injected into your client script controller. The code in a Provider differs from a typical Angular directive or service because it must be anonymous, without being appended to a specific module.

2. Click New to create a new record.
3. Fill out the form.
   a) Add the type and name.
      • Type: Directive
      • Name: categoryIcon
   b) Add the client script.

```javascript
function() {
  return {
    template: '<span class="fa fa-stack fa-lg"><i class="fa fa-circle fa-stack-2x"></i><i class="fa fa-{{::icon}} fa-stack-1x fa-inverse"></i></span>',
    restrict: 'E',
    replace: true,
    scope: {
      category: '='
    }
  }
}
```
link: function(scope, element) {

var _iconMap = {
"b06546f23731300054b6a3549dbe5dd8": "tablet", /* Tablets */
"15706fc0a0a0aa7007fc21e1ab70c2f": "question", /* Can we help you? */
"d68eb4d637b1300054b6a3549dbe5db2": "mobile-phone", /* Mobiles */
"109cdf8c6112276003b17991a09ad65": "print", /* Office and Print */
"5d643c6a3771300054b6a3549dbe5db0": "print", /* Printers */
"2c0b59874f7b4200086eeed18110c71f": "plug", /* Peripherals */
"280952237b1300054b6a3549dbe5dd4": "desktop" /* Software */
};

scope.icon = _iconMap[scope.category] || "shopping-cart";
}
}

This script associates the sys_id of the Category record with the Service Catalog item. The icon that displays is the icon defined in the Category record in the Service Catalog.
New Widget Angular Provider

Widget Angular Provider

Type
Directive

Name
categoryIcon

Client Script
```javascript
function() {
  return {
    template: '<span class="fa fa-stack fa-1x"><i class="fa fa-circle fa-stack-2x"></i><i class="fa fa-stack-1x fa-inverse"></i></span>',
    restrict: 'E',
    replace: true,
    scope: {
      category: '='
    },
    link: function(scope, element) {
      var _iconMap = {
        'a80467373138085463a3549d8628688': 'tablet', // Tablets /
        '1378624cb209663726c2812907121c46b62a': 'question', // Can we help you? /
        '60e446c3703138085463a3549d862868': 'mobile-phone', // Mobiles /
        '39bece690c12276303617951c89b0d': 'print', // Office and Print /
        '5a035c437138085463a3549d862868': 'print', // Printers /
        '2c8be907487b42e00060ed3b1818719': 'plug', // Peripherals /
        '3b9e9513703138085463a3549d8628688': 'desktop', // Software /
      };
      scope.icon = _iconMap[scope.category] || 'shopping-cart';
    }
  }
}
```

Application
1. Global

Save [M + s]
c) Click Save.

4. Associate the new Angular directive with the Quick Order Widget.
   a) Navigate to `<yourInstanceURL>/sp_config?id=widget_edit`.
   b) Open the Quick Order widget.
   c) Under Related Lists, select Angular Providers.
   d) In the Angular Providers list, click New to associate an existing Angular Provider with the Quick Order widget.
   e) Add the following values to the form.
      - Angular Provider: categoryIcon
      - Widget: Quick Order
   f) Click Save.

5. Add the categoryIcon directive to your Quick Order HTML template.
   a) From the Widget Editor, open the Quick Order widget.
   b) Replace the HTML template with the following script.

```html
<div class="panel panel-primary">
  <div class="panel-heading">Request an item from the catalog</div>
  <div class="panel-body">
    <input class="form-control" type="search" placeholder="Start typing here to search the list of catalog items" ng-model="c.data.keywords" ng-change="c.server.update()" ng-model-options="{debounce: 250}" />
    <h5 ng-if="!c.data.keywords">Showing the most popular items</h5>
    <ul class="list-group result-container">
      <li class="list-group-item" ng-repeat="item in c.data.items">
        <a href ng-click="c.select(item.sys_id)"><category-icon category="item.category" style="margin-right: 10px"></category-icon>{{item.name}}</a><span class="pull-right">{{item.price}}</span>
        <div class="catalog-item" ng-if="item.sys_id == c.openItem">
          <sp-widget ng-if="c.catalogItemWidget" widget="c.catalogItemWidget" />
        </div>
      </li>
    </ul>
    <div class="panel-footer" ng-if="c.data.keywords">
      <ng-pluralize count="c.data.items.length" when="{"0": 'No items found for ',
        '1': 'One item matching ',
        'other': 'Found {} items matching '}"
        >>
      </div>
  </div>
</div>
```

6. Refresh your test page preview to view the changes.
   A category icon displays beside each result.
Widget API reference

The following client and server side APIs are supported in the Service Portal.

Supported client side APIs

These are the supported Service Portal APIs that can be used in a widget client controller. For detailed class and method information, see the API reference on the developer portal.

<table>
<thead>
<tr>
<th>Class</th>
<th>Available methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>spUtil</td>
<td>• addErrorMessage(String message)</td>
</tr>
<tr>
<td></td>
<td>• addInfoMessage(String message)</td>
</tr>
<tr>
<td></td>
<td>• addTrivialMessage(String message)</td>
</tr>
<tr>
<td></td>
<td>• get(String widgetId)</td>
</tr>
<tr>
<td></td>
<td>• format(String, Object)</td>
</tr>
<tr>
<td></td>
<td>• refresh(Object $scope)</td>
</tr>
<tr>
<td></td>
<td>• recordWatch(Object $scope, String table, String filter, Function callback)</td>
</tr>
<tr>
<td></td>
<td>• Update(Object)</td>
</tr>
<tr>
<td>spModal</td>
<td>• alert(String message).then(fn)</td>
</tr>
<tr>
<td></td>
<td>• confirm(String message).then(fn)</td>
</tr>
<tr>
<td></td>
<td>• open(Object options).then(fn)</td>
</tr>
<tr>
<td></td>
<td>• prompt(String message, String default).then(fn)</td>
</tr>
</tbody>
</table>
Supported server side APIs

These are the supported Service Portal APIs that can be used in a widget server script.

<table>
<thead>
<tr>
<th>Class</th>
<th>Available methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>GlideSPScriptable</td>
<td>• canReadRecord(GlideRecord gr)</td>
</tr>
<tr>
<td></td>
<td>• canReadRecord(String table, String sysId)</td>
</tr>
<tr>
<td></td>
<td>• getCatalogItem(String sysId)</td>
</tr>
<tr>
<td></td>
<td>• getCatalogItem(String sysId, Boolean isOrdering)</td>
</tr>
<tr>
<td></td>
<td>• getDisplayValue(String fieldName)</td>
</tr>
<tr>
<td></td>
<td>• getField(GlideRecord gr, String fieldName)</td>
</tr>
<tr>
<td></td>
<td>• getFields(GlideRecord gr, String fieldNames)</td>
</tr>
<tr>
<td></td>
<td>• getFieldsObject(GlideRecord gr, String fieldNames)</td>
</tr>
<tr>
<td></td>
<td>• getForm(String tableName, String sysId)</td>
</tr>
<tr>
<td></td>
<td>• getListColumns(String tableName, String view)</td>
</tr>
<tr>
<td></td>
<td>• getMenuHREF(GlideRecord page)</td>
</tr>
<tr>
<td></td>
<td>• getMenuItems(String sysId)</td>
</tr>
<tr>
<td></td>
<td>• getParameter(String name)</td>
</tr>
<tr>
<td></td>
<td>• getPortalRecord()</td>
</tr>
<tr>
<td></td>
<td>• getRecord()</td>
</tr>
<tr>
<td></td>
<td>• getRecordDisplayValues(Object data, GlideRecord from, String names)</td>
</tr>
<tr>
<td></td>
<td>• getRecordElements(Object data, GlideRecord from, String names)</td>
</tr>
<tr>
<td></td>
<td>• getRecordValues(Object data, GlideRecord from, String names)</td>
</tr>
<tr>
<td></td>
<td>• getStream(String table, String sysId)</td>
</tr>
<tr>
<td></td>
<td>• getUserInitials()</td>
</tr>
<tr>
<td></td>
<td>• getValue(String name)</td>
</tr>
<tr>
<td></td>
<td>• getValues(Object data, String names)</td>
</tr>
<tr>
<td></td>
<td>• getWidget(String sysID, Object options)</td>
</tr>
</tbody>
</table>

Widget properties

Global variable and functions available in widget client and server scripts.

Server script global objects

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>input</td>
<td>An object containing client-side properties set under c.data. The value is undefined until the client controller calls c.server.update().</td>
</tr>
<tr>
<td>data</td>
<td>An object containing properties set during server-side execution.</td>
</tr>
<tr>
<td>options</td>
<td>An object containing the schema option properties.</td>
</tr>
</tbody>
</table>
Client script global functions

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>this.server.get([Object])</td>
<td>Calls the server and sends custom input. Returns Promise.</td>
</tr>
<tr>
<td>this.server.update()</td>
<td>Calls the server and posts this.data to the server script. Returns Promise.</td>
</tr>
<tr>
<td>this.server.refresh()</td>
<td>Calls the server and automatically replaces the current options and data from the server response. Returns Promise.</td>
</tr>
</tbody>
</table>

A promise represents the eventual result of an asynchronous operation. For more information on promises, see [https://promisesaplus.com/](https://promisesaplus.com/) or [AngularJS documentation](https).

Widget troubleshooting guide

Use the following tools to investigate and resolve unexpected behavior in your custom Service Portal widgets.

Reduce complexity

Deactivate widgets unrelated to the widget you are troubleshooting to isolate parts of the page that may be causing errors or unexpected behavior. Set the active field to false on a widget record to hide the widget on the page, and prevent associated scripts from executing.

Use the browser developer console

All supported desktop browsers have built-in developer tools. Access your browsers developer tools to view console messages and errors thrown by client-side javascript. Many of the logging tools detailed below output information to this console.

Use the widget context menu to access information and options

CTRL+right-click a widget to access configuration options for the widget. There are also options to output the scope and scope data object to the browser console. For more detail on this menu, see [Widget context menu](https).

Use script methods to capture debugging output

Several methods are available to output debugging information within your server and client-side code.

<table>
<thead>
<tr>
<th>Method</th>
<th>Availability</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>console.log()</td>
<td>Server and client</td>
<td>Logs output to the browser developer console.</td>
</tr>
<tr>
<td>Method</td>
<td>Availability</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>$sp.log()</td>
<td>Server</td>
<td>Logs output to the Service Portal Log Entries [sp_log] table, when the logged in user has the sp_admin or admin role.</td>
</tr>
<tr>
<td>gs.log()</td>
<td>Server</td>
<td>Logs output to the Log [syslog] table.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> gs.log creates records on the syslog table. Excessive use can adversely affect performance.</td>
</tr>
<tr>
<td>gs.warn()</td>
<td>Server</td>
<td>Produces warning level output in the Log [syslog] table.</td>
</tr>
<tr>
<td>gs.error()</td>
<td>Server</td>
<td>Produces error level output in the Log [syslog] table.</td>
</tr>
<tr>
<td>gs.addInfoMessage()</td>
<td>Server</td>
<td>Displays a green information message at the top of the browser window.</td>
</tr>
<tr>
<td>spUtil.addErrorMessage()</td>
<td>Client</td>
<td>Displays a red error message at the top of the browser window.</td>
</tr>
<tr>
<td>spUtil.addInfoMessage()</td>
<td>Client</td>
<td>Displays an Info message within the browser window.</td>
</tr>
<tr>
<td>spUtil.addTriviaMessage()</td>
<td>Client</td>
<td>Displays a message which automatically disappears after a short time.</td>
</tr>
<tr>
<td>debugger</td>
<td>Client</td>
<td>Sets a break point in Chrome and Firefox browsers, allowing you to step through a script line by line in the browsers developer console.</td>
</tr>
<tr>
<td>Method</td>
<td>Availability</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>--------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>{{data</td>
<td>json}}</td>
<td>HTML</td>
</tr>
</tbody>
</table>

**Check for security restrictions**

Often, widget display issues are caused by access rules rather than the widget script. Verify that any records that are not accessible within a widget are accessible using the platform UI. Use the ACL debugger to ensure that your users have the expected access to records used by your widgets. For more detail on the debugger, see [ACL debugging tools](#).

**Create a reference to the widgets scope in the console**

Use reference to a widget to manipulate scope data or manually run the widgets client and server scripts. Use the following steps to create the reference.

1. Right-click the widget and choose Inspect.
2. In dev tools Elements tab, click to highlight the element with attribute widget=widget. You can find it a few elements above the currently inspected element. This element points the $0 scripting tool at the widget.
3. In the Javascript console, run the following code:
   ```javascript
   var scopeRef = angular.element($0).scope();
   ```

   Use the reference to your widget to change data within the console. See the following example. Remember to run AngularJS $apply() on the scope to apply changes to the page.
   ```javascript
   scopeRef.data.prop1 = "Pear";
   scopeRef.$apply();
   ```
   Run any function defined in the widgets client controller from your reference using the syntax below.
   ```javascript
   scopeRef.exampleFunction();
   ```

   Use the refresh command to manually execute the widgets server script.
   ```javascript
   scopeRef.server.refresh();
   ```

**Service Portal search**

Service Portal displays search data within a widget on the search page. To make data searchable from Service Portal, create a search source that fetches data from a single table within your ServiceNow
instance, from multiple ServiceNow tables, or from an external site. Add facets to the search source to enable end users to filter search results.

**Search sources**

A search source is a record that describes the behavior and source of searchable data. A search source defines:

- Where search data is retrieved from.
- Whether search suggestions can populate the search field based on user input.
- How a search entry displays in the search result page.

Search sources have simple and advanced configurations.

**Simple**

Define a table within your ServiceNow instance as a source of searchable data. To learn more, see *Define a search source* on page 2859.

**Advanced**

Define a data fetch script to return data. A data fetch script executes on the server and returns a result array to the search widget. This method is more complex, but offers complete power over how a search is executed. You are not limited to querying single tables within ServiceNow and can define a script that fetches data from multiple tables, or from anywhere on the web. To learn more, review the *Tutorial: set up an external knowledge base search source* on page 2864.

**Note:** Search facets may not behave as expected if integrated into an advanced search source that queries data from a non-ServiceNow site.

**Typeahead settings**

Typeahead returns search results as a user types in the search field. You can configure typeahead settings, or disable the feature entirely, within the search source record.

**Simple**

Define an icon to display beside typeahead results and the target page to display typeahead selections.

**Advanced**

Define a template for the typeahead result. See *Create an advanced typeahead template* on page 2863.

**Search facets**

Enable your end users to filter search results for a more meaningful result set. Facets can return results based on:

- Fields in a table such as Active or Author.
• Query conditions such as [Updated][After][Last week].

**Note:** Only set search facets for indexed fields. Fields that are not indexed may take longer to return results and are not optimized for a fast search experience. Learn more: [Enable text indexing for a table](#).

Search facets render in the Faceted Search widget on the sp_search page. In new instances, search facets are enabled by default. If upgrading from a previous release, enable search facets by activating a record in the Page Route Maps [sp_page_route_map] table. See [Enable search facets](#) on page 2869.

**Simple**

Enable end users to refine search results for a simple search source. You can create facets for a table search source that return results based on field values or query conditions. See [Add facets to a simple search source](#) on page 2870.

**Advanced**

Define facets for advanced search sources using the Facet generation script on the search source record. Use facet APIs to create facets and assign ServiceNow facet items or mapped queries to the facet.

<table>
<thead>
<tr>
<th>API</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>SPScriptedFacetService</code></td>
<td>Creates a single or multi choice facet.</td>
</tr>
<tr>
<td><code>SPScriptedFacet</code></td>
<td>Defines facet items, filters, or mapped queries for the facet.</td>
</tr>
</tbody>
</table>

**Search configurations**

When a simple search source is defined, Service Portal uses the search engine settings configured on your instance. To learn more, see [Search administration](#).

**Performance recommendations**

To avoid performance degradation and to ensure a fast search experience for end users, follow these recommendations.

• Limit search sources when possible to perform only the necessary query. For example, if a search only needs to return active incidents, add a condition to the search source set to [Active] [is] [true]. A search that queries only active incidents is faster than a search that queries all records in the incident table.

• Create facet items and mapped queries with no more than 30 filter items. To verify, test each search source with a variety of keywords as a user with low permissions.

**Note:** Search results in service portal are displayed as text only. HTML tags, images, and formatting do not display in search results.
Define a search source

Configure a basic search source to query data from an instance table, or configure an advanced data fetch script to query data across multiple tables and data sources, or to pull data from anywhere on the web.

1. In the platform UI, navigate to Service Portal Portals and select the portal you want to add search sources to.
2. From the Search Sources related list, click New to add a search source.
3. Define the fields on the Search Source form.

<table>
<thead>
<tr>
<th>Table 1163: Search Source form</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Field</strong></td>
</tr>
<tr>
<td>Name</td>
</tr>
<tr>
<td>ID</td>
</tr>
<tr>
<td>Application</td>
</tr>
<tr>
<td>Roles</td>
</tr>
<tr>
<td>Search page template</td>
</tr>
</tbody>
</table>

4. Complete the fields on the Data Source tab.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is scripted source</td>
<td>Adds an advanced data fetch script. If configuring an instance table as the data source, do not check this option.</td>
</tr>
<tr>
<td>Data fetch script</td>
<td>Script defining the endpoint and API calls to fetch data. This field is only visible when Is scripted source is selected. For an example of a data fetch script, see Tutorial: set up an external knowledge base search source on page 2864.</td>
</tr>
</tbody>
</table>

**Note:** If defining a facet generation script, inject the facets object into the data fetch script and update the script to generate data for each facet item. For an example, see the Knowledge Base and Service Catalog search sources. Search facets may not behave as expected if integrated into an advanced search source that queries data from a non-ServiceNow site.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facet generation script</td>
<td>Script defining search facets for a scripted search source. Enable your end users to filter search results for a more meaningful result set. This field is only visible when Is scripted source is selected.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> If defining a facet generation script, inject the facets object into the data fetch script and update the script to generate data for each facet item. For an example, see the Knowledge Base and Service Catalog search sources. Search facets may not behave as expected if integrated into an advanced search source that queries data from a non-ServiceNow site.</td>
</tr>
<tr>
<td>Table</td>
<td>Select a table from the list that you want to draw your results from. You can select any table in the platform. For example, User [sys_user] or Knowledge [kb_knowledge].</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Only indexed tables return search results. Learn more: Enable text indexing for a table.</td>
</tr>
<tr>
<td>Conditions</td>
<td>Filters results based on defined conditions. For example, Active is True.</td>
</tr>
<tr>
<td>Primary display field</td>
<td>Select which field you want to display on the search results page. For example, Name.</td>
</tr>
<tr>
<td>Display fields</td>
<td>Select additional fields to display on the search results page. For example, User ID, Email, and City.</td>
</tr>
<tr>
<td>Paginate results</td>
<td>Paginates search results. True by default.</td>
</tr>
<tr>
<td></td>
<td>If Is scripted source is selected, the value updates to false. To enable pagination for a scripted search source, see Paginate search source results on page 2861.</td>
</tr>
<tr>
<td></td>
<td>Define the maximum number of results per query for the search source in the Search Page widget or Faceted Search widget instance options.</td>
</tr>
</tbody>
</table>

5. Configure Typeahead settings to allow search results to populate the search field based on user input.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable typeahead</td>
<td>Allows typeahead functionality. If you do not want to integrate typeahead into your search source, clear the check box.</td>
</tr>
<tr>
<td>Advanced typeahead config</td>
<td>Optionally add an advanced typeahead script to configure the way search results display. For more information, see Create an advanced typeahead template on page 2863.</td>
</tr>
<tr>
<td>Typeahead glyph</td>
<td>Adds an icon beside each typeahead result.</td>
</tr>
<tr>
<td>Page</td>
<td>Defines a service portal page to display the selected result. For example, if form is configured, a selected typeahead result opens in a form.</td>
</tr>
</tbody>
</table>
6. Click Submit.

To enable end users to refine search results, *Add facets to a simple search source* on page 2870.

### Paginate search source results

Limit the number of results that a search source displays at one time to improve performance. End users can load more results as needed.

**Role required:** admin or sp_admin

If adding pagination to a simple search source, set Paginate results on the search source record to true. However, if adding pagination to an advanced search source, you must also modify the data fetch script to handle multiple pages of results. When a user loads more search results, the search source re-executes the data fetch script.

**Note:** If paginating a search source with advanced facets, do not modify the facet generation script to load facets based on the results from each page. Facets should enable end users to filter results from an entire result set, rather than page-specific results.

1. In the platform UI, navigate to Service Portal Search Sources.
2. Open a search source to add pagination to.
3. Set Paginate results to true.
   
   Enabling this field adds a Load more results button to the search results page. This flag automatically enables pagination for simple search sources.

4. If the search source is advanced, modify the data fetch script to handle multiple search result pages.
   
   Update the data fetch script using one of the following GlideRecord APIs, depending on the scope of the search source.

<table>
<thead>
<tr>
<th>Scope</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global</td>
<td>setLocation() in GlideRecord</td>
</tr>
<tr>
<td>Scoped application</td>
<td>chooseWindow() in GlideRecord</td>
</tr>
</tbody>
</table>
The following is an example data fetch script for a global search source that queries the incident table and paginates results.

// queryLocation is a special value injected into the script, // which holds the query_location property of the last item // in the previously fetched result set
(function(query, queryLocation, count) {
    var results = [];
    var gr = new GlideRecord("incident");
    gr.addQuery("123TEXTQUERY321", query);
    gr.query();
    // Here, we are utilizing queryLocation to implement pagination.
    // In practice, there are many other ways to use the
    // query_location value of the last item in the previous
    // result set to implement pagination. Your implementation
    // will vary by use case.
    gr.setLocation(queryLocation - 1);
    var resultCount = 0;
    while(gr.next() && resultCount < count + 1) {
        results.push({
            label: gr.getDisplayValue(),
            short_description: gr.getValue("short_description"),
            // Here, we are populating the query_location
            // property of each result item. This is how the
            // framework knows what value to pass into the
            // next fetched search result script execution
            query_location: gr.getLocation(),
            primary: gr.getDisplayValue(),
            state: gr.getDisplayValue("state")
        });
        resultCount++;
    }
    if (results.length == 0)
        return results;
    if(results.length > count) {
        results.pop();
    } else {
        // In order to indicate that a result in the result
        // set is the final result (that there are
        // no more results to be fetched), add this property
        // to the final element in your result set.
        results[results.length - 1].isLastResult = true;
    }
    return results;
})(query, queryLocation, count, facets);

For an additional example, see the Knowledge Base search source.

5. Define the maximum number of results per query for the search source in the Search Page widget or Faceted Search widget instance options.

The search page only returns the defined number of results at one time. When a user selects Load more results, the search source re-executes the query or data fetch script.
Create an advanced typeahead template

Configure the way typeahead results display with an advanced template.

1. Complete the required fields in *Define a search source* on page 2859.
2. In the Typeahead tab of the Search Source record, select the Advanced typeahead config check box.
3. In the Typeahead template field, add an HTML template.

   This example uses AngularJS bindings to display service catalog images in the typeahead results.

   ```html
   <i class="ta-img" ng-if="match.model.type== 'sc'" style="background-image:url('{{match.model.picture}}')"></i>
   <i class="ta-img" ng-if="match.model.type== 'sc_guide'" style="background-image:url('{{match.model.picture}}')"></i>
   <i class="ta-icon fa fa-file-text-o" ng-if="match.model.type== 'sc_content' && match.model.content_type == 'kb'"></i>
   ```
4. Click Update.
Typeahead results display beside the image defined in the service catalog record.

![Typeahead results display](image)

## Tutorial: set up an external knowledge base search source

Define an advanced search source to return data from any source on the Internet. To understand the power of search sources, follow this tutorial to set up an external knowledge base search source.

To create an advanced search source, you need an external resource that you can access via REST and basic knowledge of AngularJS.

In this integration, you will:

- Create a data fetch script that uses the ServiceNow Table API to query a knowledge base from another ServiceNow instance.
• Decode the JSON response and define the fields that the search widget expects.
• Update the search sources HTML template to open the search result in the external site.

1. In the platform UI, navigate to Service Portal Portals and select the portal you want to add the search source to.
2. From the Search Sources related list, click New.
3. Create a name and ID for the search source. The ID should be unique, and should not include any spaces or special characters.
4. On the Data Source tab, select the Is scripted source check box.
5. Add content to the data fetch script field.
   a) Define the search function to be executed by the instance.

      This example uses a recordless RESTMessage, but you can modify this example to use a pre-configured Outbound REST web service if needed, or create a more secure authentication profile.

      (function(query) {
        var results = [];
        /* Calculate your results here. */
        var url = "https://myInstance.service-now.com/api/now/table/kb_knowledge?sysparm_query=GOTO123TEXTQUERY321%3D" + encodeURI(query) + "&sysparm_fields=sys_id%2Cnumber%2Cshort_description%2Ccategory%2Ctext";
        var ws = new sn_ws.RESTMessageV2();
        ws.setBasicAuth("search_user", "search");
        ws.setHttpMethod("get");
        ws.setEndpoint(url);
        var jsonOutput = ws.execute();
        return results;
      })(query);

      Note: In the preceding example, sw.setBasicAuth requires a user and password for the remote instance. For more detail, see RESTMessageV2.

   b) Add an if statement to the data fetch script to decode the JSON object being returned, iterate over each result, and set expected fields.

      The final data fetch script:

      (function(query) {
        var results = [];
        /* Calculate your results here. */
        var url = "https://myInstance.service-now.com/api/now/table/kb_knowledge?sysparm_query=GOTO123TEXTQUERY321%3D" + encodeURI(query) + "&sysparm_fields=sys_id%2Cnumber%2Cshort_description%2Ccategory%2Ctext";
        var ws = new sn_ws.RESTMessageV2();
        ws.setBasicAuth("search_user", "search");
        ws.setHttpMethod("get");
        ws.setEndpoint(url);
        var jsonOutput = ws.execute();
        if (jsonOutput) {
          var response = new JSON().decode(jsonOutput.getBody());
          results = response.result;
          results.forEach(function(result) {
            result.url = "https://myInstance.service-now.com/kb_view.do?sysparm_article=" + result.number;
            result.target = "_blank";
            result.primary = result.short_description;
          });
        }
      })(query);
In this example, the following fields are set on the result object:

- **url**: If linking to an external site rather than opening the record in your ServiceNow instance, this defines where the link leads to.
- **target**: The target for the link. Set the target to `/_blank` to open results in a new tab, otherwise leave it blank.
- **primary**: The primary field displayed in the search results.

6. **Update the search page template to open the search results in the external site.**

   `<div>
   <a href="https://myInstance.service-now.com/kb_view.do?sysparm_article//{{item.number}}" target="_blank" class="h4 text-primary m-b-sm block">
   <span ng-bind-html="highlight(item.primary, data.q)"></span>
   </a>
   <span class="text-muted" ng-repeat="f in item.fields | limitTo: 4">
   {{f.label}}: <span ng-bind-html="highlight(f.display_value, data.q)"></span>
   </span>
   </div>

7. **Click Update.**

   Test the external search in your portal. Results display under the name field value defined in step three.
Each search result opens in the external site defined in the search page template.
Example: set up a GitHub search source

Set up an advanced search source that queries data from an external site.

To create an advanced search source, you need an external resource that you can access via REST and basic knowledge of AngularJS.

1. In the platform UI, navigate to Service Portal Portals and select the portal you want to add search sources to.
2. From the Search Sources related list, click New.
3. Create a name and ID for the search source.
   The ID should be unique, and should not include any spaces or special characters.
4. On the Data Source tab, select the Is scripted source check box.
5. Add content to the data fetch script field.

To set up a GitHub integration:

```javascript
(function(query) {
  var results = [];
  /* Calculate your results here. */
  var url = "https://api.github.com/search/repositories?q=" +
  encodeURI(query);
  var ws = new GlideHTTPRequest(url);
  ws.setBasicAuth("YOUR_USERNAME_HERE", "YOUR_PASSWORD_HERE");
  var jsonOutput = ws.get();
  if (jsonOutput) {
    var response = new JSON().decode(jsonOutput.getBody());
    results = response.items;
    results.forEach(function(result) {
      result.url = result.svn_url;
      result.target = "_blank";
      result.primary = result.full_name;
    });
  }
  return results;
})(query);
```

6. Use the Search page template to customize the way the search results display.

   `<div>
   <div class="pull-right">
     <strong>{{item.language}}</strong>
     <a ng-href="{{item.svn_url}}/stargazers" target="_blank" class="m-l-sm"><span class="fa fa-star m-r-xs"></span>{{item.stargazers_count}}</a>
     <a ng-href="{{item.svn_url}}/network" target="_blank" class="m-l-sm"><span class="fa fa-code-fork m-r-xs"></span>{{item.forks}}</a>
   </div>
   <a ng-href="{{item.svn_url}}" target="_blank" class="h4 text-primary m-b-sm block">
     <span ng-bind-html="highlight(item.full_name, data.q)"></span>
   </a>
   <p>{{item.description}}</p>
   <p>Updated <sn-time-ago timestamp="item.updated_at"></sn-time-ago> ago</p>
   </div>`

Enable search facets

In new instances, search facets are enabled by default. If upgrading from a previous release, enable search facets by activating a record in the Page Route Maps [sp_page_route_map] table.

Role required: admin or sp_admin

Search facets render in the Faceted Search widget on the sp_search page. To enable search facets after upgrade, activate the page route map record to route your search results to render in the sp_search page.

1. Navigate to Service Portal Page Route Maps.
2. Locate the Search record in the list.
This record redirects users from the search page to the sp_search page when viewing search results in Service Portal. The sp_search page includes the Faceted Search widget, which supports search facets in both desktop and mobile environments.

3. Set the Active field to true.

When using search in Service Portal, results render in the sp_search page. Add facets to the search source to enable end users to filter search results. To learn more about facets, see Add facets to a simple search source on page 2870.

Add facets to a simple search source

Enable end users to refine search results for a simple search source. You can create facets for a table search source that return results based on field values or query conditions.

Role required: admin or sp_admin

In new instances, search facets are enabled by default. If upgrading from a previous release, enable search facets by activating a record in the Page Route Maps [sp_page_route_map] table. See Enable search facets on page 2869. Create facet items and mapped queries with no more than 30 filter items. To verify, test each search source with a variety of keywords as a user with low permissions.

Note: Only set search facets for indexed fields. Fields that are not indexed may take longer to return results and are not optimized for a fast search experience. Learn more: Enable text indexing for a table.

1. Navigate to Service Portal Search Sources.
2. Open or create a simple search source.
   Simple search sources do not use a data fetch script. Rather, they define a table as the source of searchable data. To learn more about search sources, see Service Portal search on page 2856.
3. Select the Facets related list.
4. Click New.
   The Facet form displays.
5. Complete the fields.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Display name of the facet header.</td>
</tr>
<tr>
<td>Application</td>
<td>Application scope of the search source. This value is read-only.</td>
</tr>
<tr>
<td>Selection type</td>
<td>Type of user selection allowed:</td>
</tr>
<tr>
<td></td>
<td>• Single: Only one filter value can be selected at a time. For</td>
</tr>
<tr>
<td></td>
<td>example, if a facet is created for the Assigned to field, the</td>
</tr>
<tr>
<td></td>
<td>end user can select Fred Luddy or Beth Anglin, but not both at</td>
</tr>
<tr>
<td></td>
<td>the same time. Before filtering for a new value, the user must</td>
</tr>
<tr>
<td></td>
<td>first clear the current value.</td>
</tr>
<tr>
<td></td>
<td>• Multiple: Multiple filter values can be selected at the same</td>
</tr>
<tr>
<td></td>
<td>time. For example, if a facet is created for the Assigned to</td>
</tr>
<tr>
<td></td>
<td>field, the end user can select both Fred Luddy and Beth Anglin.</td>
</tr>
<tr>
<td></td>
<td>Because multi choice results in an OR query, records assigned</td>
</tr>
<tr>
<td></td>
<td>to either Fred Luddy or Beth Anglin display.</td>
</tr>
<tr>
<td>Active</td>
<td>Whether the filter option displays in search results.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Use mapped facet filters</td>
<td>Maps a facet to a query condition, such as [Updated][After] [Last week]. When selected, the Fields and Sort fields are removed from the form. After saving, define filters in the Facet Filters related list.</td>
</tr>
<tr>
<td>Order</td>
<td>Defines the display order when multiple facets are defined. If some facets do not have an order value defined, facets with an order defined display first. Facets without an order defined are displayed alphabetically.</td>
</tr>
<tr>
<td>Table</td>
<td>Table that the query is created for. This value is read-only and defined by the table used in the search source.</td>
</tr>
<tr>
<td>Field</td>
<td>Field that end users can filter search results by. For example, if Active is selected, the user can filter search results by true or false. Only fields of the following types are supported: True/False, Choice, Decimal, Floating Point Number, Integer, IP Address, Long, Reference, String, String (Full UTF-8), and URL.</td>
</tr>
<tr>
<td>Sort</td>
<td>Determines the order in which filter options display.</td>
</tr>
<tr>
<td></td>
<td>• Ascending: Sorts filter options from A to Z when alphabetical, and from lowest to highest when numerical. This is the default option.</td>
</tr>
<tr>
<td></td>
<td>• Descending: Sorts filter options from Z to A when alphabetical, and from highest to lowest when numerical.</td>
</tr>
</tbody>
</table>

6. Save the record.
   If Use mapped facet filters is selected, the Facet Filters related list appears in the facet form.

7. If Use mapped facet filters is selected, define facet filters. Map facet filters map a query condition to a facet label. When the end user selects the label from the facet list, the defined query executes.
   a) In the Facet Filters related list, click New. The Mapped Facet Form appears.
   b) Define the facet filter fields.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Display name of the facet filter option.</td>
</tr>
<tr>
<td>Order</td>
<td>Defines the display order when multiple facet filters are defined. If some facet filters do not have an order value defined, facets filters with an order defined display first. Facet filters without an order defined are displayed alphabetically.</td>
</tr>
<tr>
<td>Application</td>
<td>The application scope of the search source. This value is read-only.</td>
</tr>
<tr>
<td>Facet</td>
<td>The search facet that uses the mapped query. This value is read-only.</td>
</tr>
</tbody>
</table>
Enable search facets

Search facets allow users to filter search results and display them with relevant properties. Administrators can enable or disable facets for one or more search sources by adding a system property. Once enabled, the search source displays search facets in the Faceted Search widget on the sp_search page. You can enable facets for simple or advanced search sources.

Role required: admin or sp_admin

1. Enter sys_properties.list in the Application Navigator to navigate to the System Properties table.
2. Click New.
   The System Property form opens.
3. In the Name field, enter glide.service_portal.enable_search_facets.
4. In the Value field, enter a comma-separated list of search source Sys IDs to enable facets for. Do not include spaces. For example, c6170ae86721220023c82e08f585efe6,c96eb1686721220023c82e08f585efff.
5. Click Submit.

Facets display when the defined search source is selected in the sp_search page.

Set the default portal search source

If you don't define specific search sources for your portal, the system uses default search sources instead. Administrators can use the glide.service_portal.default_search_sources system property to define default search sources.

To make changes to the default search sources, navigate to the sys_properties list and search for the default search sources property. Copy the sys_ID of any search source you want to add into the Value field of the system property using a comma separated list.

To change the order in which the default search sources show in the Search List, change the order of the IDs in the property.

To remove the default search source behavior, delete the property value or delete the property altogether.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table</td>
<td>The table defined in the search facet. This value is read-only.</td>
</tr>
<tr>
<td>Mapped query</td>
<td>A query condition that users can set to filter search results. For example, [Updated][On][Today].</td>
</tr>
</tbody>
</table>
Configure Search Sources available on a page

Use contextual search to limit search results for an instance of the type-ahead search widget.

With contextual search enabled, users only see type-ahead results for specific search sources. For example, searching on the Service Catalog page only shows results from the Service Catalog search source when contextual search is enabled.

1. In the Service Portal Designer (Service Portal Service Portal Configuration Service Portal Designer), find an instance of the type-ahead search widget.

2. Point to the widget and click the edit icon ( ).

   Alternatively, in any preview page containing the type-ahead search widget, for example the Service Catalog homepage, control + right-click to open the widget context menu. Then click Instance Options.

3. In the Contextual Search Sources field, select search sources from the list.

   Search sources listed for contextual search can be limited to just one, several, or all search sources.

Default search sources are defined in the glide.service_portal.default_search_sources property, so even if you do not have search sources configured, type-ahead search widget still shows type-ahead suggestions. For more information on default search sources, see Set the default portal search source on page 2872.
Service Portal announcements

Use announcements to broadcast messages to Service Portal users. Announcements can display in an announcement banner or an announcement widget instance.

Announcements are active on new instances. To activate announcements after upgrade, you can activate the Service Portal Announcements plugin (com.glide.service-portal.announcements).

When creating announcements, you can define the way an announcement displays.

Sort order

Announcements are displayed depending on the order defined in:

- The `glide.service_portal.announcement.default.sort_order` system property. See Service Portal properties on page 2646.
- The Display First field in the announcement record.

If there is a tie between two records set to Display first, the sort order defined in the system property is honored.

Display location

Announcements can display in the following locations:

- Announcement banner
- Announcements widget instance
Email server down
We are aware of the issue and are taking steps to correct it.
To define the announcement display location, define the announcement type in the announcement record.

**Display Style**

Using display styles, you can:

- Create a custom color scheme.
- Change the text alignment.

Announcements that appear in a banner use the display style defined in the Announcement record by default. To use the display style in an instance of the Announcements widget, you can select the Use Display Style instance option.

**User criteria**

If user criteria is set up for the Service Portal, you can define who can and who cannot view an announcement. Through user criteria, you can create announcements only visible to specific users, groups, roles, organizations, and more.

Create an announcement

Announcements display as a banner in a Service Portal or within the announcements widget.

Role required: admin, sp_admin, or announcement_admin

1. Navigate to Service Portal Announcements.
   The Announcements table [announcement] displays all announcements.
2. Click New.
3. Complete the form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Internal title that does not display in the announcement.</td>
</tr>
<tr>
<td>Active</td>
<td>Whether the announcement is active. Inactive announcements do not display.</td>
</tr>
<tr>
<td>Title</td>
<td>The display title of the announcement.</td>
</tr>
<tr>
<td>From</td>
<td>Date and time the announcement begins to display.</td>
</tr>
<tr>
<td>To</td>
<td>Date and time the announcement ends. If this field is not defined, the announcement continues to display until it is deactivated.</td>
</tr>
<tr>
<td>Summary</td>
<td>The display text of the announcement.</td>
</tr>
<tr>
<td>Display style</td>
<td>Defines the background color, text color, and text alignment of banner announcements. Base system styles include:</td>
</tr>
<tr>
<td></td>
<td>• Normal: Blue background and left-aligned, white text. This is the default style.</td>
</tr>
<tr>
<td></td>
<td>• Urgent: Red background and left-aligned, white text.</td>
</tr>
</tbody>
</table>

Announcements that appear in a banner use the display style defined in the Announcement record by default. To use the display style in an instance of the Announcements widget, you can select the Use Display Style instance option.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
</table>
| Type                | Defines where an announcement displays. By default, announcements display in the following locations:  
  • Banner: Announcement banner above the banner frame in the Service Portal.  
  • Widget: Instance of the announcements widget.  
  
You can create an announcement type to define other widget instances to display an announcement. |
| Glyph               | Glyph to display to the left of the title in banner announcements.                                                                                                                                                                                                                                                                           |
| Glyph alt text      | Alternative text for the glyph icon used with screen readers.                                                                                                                                                                                                                                                                             |
| Public              | Whether the announcement can be viewed before login.                                                                                                                                                                                                                                                                                        |
| Roles               | If Public is not selected, you can define roles that the announcement is visible to. If no roles are selected, the announcement is visible to all roles. If User criteria for Service Portal on page 2882 is set up and Public is not selected, you can define user criteria for the announcement record instead of defining roles. |
| Display first       | If selected, the announcement displays before all other announcements.  
  
If there is a tie between two records set to Display first, the sort order defined in the glide.service_portal.announcement.default.sort_order system property is honored. See Service Portal properties on page 2646. |
| Click target        | Creates a link below the announcement body that opens to a target page or URL.  
  • None: No link is included in the announcement.  
  • Page: Opens a Service Portal page in the current browser tab.  
  • URL in current browser tab: Opens a URL in the current browser tab.  
  • URL in new browser tab: Opens a URL in a new browser tab.  
  
If the Details link text field is blank and a click target is defined, the title of the announcement is the link. |
| Details page        | The page that opens in the current browser tab. Available if the Click target is Page.                                                                                                                                                                                                                                                     |
| Details URL         | The URL that opens in the current or new browser tab. Available if the Click target is URL in current browser tab or URL in new browser tab.                                                                                                                                                                                                 |
| Details link text   | Link text for the page or URL click target. If this field is blank and a click target is defined, the title of the announcement is the link.                                                                                                                                                                                                     |
| Dismiss options     | Determines whether the user can dismiss the announcement. Options include:  
  • User can dismiss - no redisplay  
  • User can dismiss for current session only  
  • User cannot dismiss                                                                                                                                                                                                                                                                                       |
4. Save or submit the record.
5. If User criteria for Service Portal on page 2882 is set up and Public is not selected, you can define user criteria for the announcement record. Announcements only display to users that pass the access criteria.
6. Update the record.

If the Type is Banner, test your announcement by navigating to the portal defined in the Portals field. If the Type is Widget or a custom type, test your announcement by navigating to the page with the associated widget instance.

Create an announcement display style

Define the background color, foreground color, and text alignment of one or more announcements. Announcements that appear in a banner use the display style defined in the Announcement record by default. To use the defined display style in a widget, you can select an instance option.

Role required: admin, sp_admin, or announcement_admin
1. Navigate to Service Portal Announcements.
2. Open an existing announcement or create a new announcement.
3. In the Display style field, click the reference lookup icon to open the referenced table. The Announcement Styles [announcement_style] list view opens.
4. Click New to create a new display style.
5. Complete the form.
6. Click Submit.

Navigate to the Service Portal associated with the announcement record to view the announcement.

Create an announcement type

Announcement types determine where an announcement displays. Announcements include two base system types: banner and widget.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Internal name of the display style.</td>
</tr>
<tr>
<td>Application</td>
<td>The application scope of the announcement. This value is read-only.</td>
</tr>
<tr>
<td>Background color</td>
<td>Color name or HEX value in the format #000000 for the announcement background.</td>
</tr>
<tr>
<td>Foreground color</td>
<td>Color name or HEX value in the format #000000 for the announcement text.</td>
</tr>
<tr>
<td>Alignment</td>
<td>Text alignment. Options include:</td>
</tr>
<tr>
<td></td>
<td>• Left align</td>
</tr>
<tr>
<td></td>
<td>• Center align</td>
</tr>
</tbody>
</table>
Role required: admin, sp_admin, or announcement_admin

Similar to creating a category tag, you can create alternative types to define custom locations. For example, to display an announcement only in a specific widget instance, you can create an announcement type for that widget instance. Any announcements tagged with that type will only display in the desired widget instance.

1. Navigate to System Definition Tables Announcement Consumer Type.
   The Announcement Consumer Type table [announcement_consumer_type] opens.
2. In the Columns section of the form, Click New.
3. Define a Name. The name is used to associate an announcement with a widget instance.
4. Click Save.
5. Add the custom type to an announcement.
   a) Navigate to Service Portal Announcements.
   b) Open an existing announcement or create a new announcement.
   c) In the Type field, select the custom type.
   d) Click Save.

6. If using the type in a widget, define the type as a widget instance option.
   The announcement banner only displays announcements tagged with the Banner type.
   a) Navigate to an instance of the Announcement widget.
   b) Control + right-click the widget instance and select Instance Options.
   c) In the Type field, select the custom announcement type.

The widget instance associated with the type displays any announcements tagged with the same type.

Service Portal security

Control user access to a portal.

Control who accesses your portal and what they can see in the following ways:

- Authentication: Configure login and single sign on for users
- Limit page access by role: Use roles to limit the users who can see a page.
- Public pages: Use the public check box on a page record to make the page publicly accessible.

Note: A number of portal pages that are installed by default are marked public. Filter your list of Service Portal pages for Public [is] true to identify these pages. Setting the Public value to false will prevent these pages from being publicly available.

- User criteria: For a more advanced way of limiting user access, create and apply user criteria to pages, widgets, widgets instances, and search sources.

Single sign-on, logins, and URL redirects

Service Portal uses a combination of system properties and script includes to determine how the system handles URL redirects for users logging in to the portal.

Only users who understand SSO, URL redirects, and the ServiceNow platform should make any changes.
Single sign-on and Service Portal

To use single sign-on with Service Portal, you must enable the Integration - Multiple Provider Single Sign-On Installer plugin (com.snc.integration.sso.multi.installer).

If you are using the system property to automatically redirect to your primary IdP, then Service Portal automatically redirects to that IdP. If you have multiple identity providers, Service Portal shows a link on the login page to Use external login. For more information on SSO and authentication in the platform, see Multiple-Provider single sign-on (SSO).

Require authentication for a Service Portal page

If you want to require authentication for a Service Portal page, ensure that the Public flag on the page record is not selected. For more information, see Create and edit a page using the Service Portal Designer on page 2668. If a user navigates to a non-public page, they are redirected to the login page for the requested portal.

Because every page request is routed through the $sp page, this page must be public. The following values in the Public Pages sys_public table define the page as public:

- Page: $sp
- Active: true

Configure the Service Portal login page

Administrators can configure a login page URL redirect for a portal.

1. In the [sys_properties] table, make sure these properties are set to the following values:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.entry.page.script</td>
<td>new SPEntryPage().getLoginURL()</td>
<td>Login page determination</td>
</tr>
</tbody>
</table>

2. It is better to leave this alone, but if you do need to customize the actual entry page, from the Script Includes table, search for SPEntryPage.

   **Note:** If you make changes to the script include, it won’t be upgraded with future updates.

3. Edit the script on the SPEntryPage to change the assigned portal to the portal_suffix you want. SPEntryPage uses /sp/ as the portal path to redirect to. Enter your own portal_suffix in place of sp.

   ```javascript
   SPEntryPage.prototype = {
     initialize: function() {
       this.logVariables = false; // for debugging
       this.portal = ""/sp/""; // The URL suffix specified in the sp_portal record
     },
   }
   ```

Redirect to Service Portal after login

Use system properties and script includes to conditionally redirect users to a page after logging in.
Follow these steps to redirect a user to Service Portal after they log in.

1. In the sys_properties table, add the following property:

<table>
<thead>
<tr>
<th>Property</th>
<th>Type</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.entry.first.page.script</td>
<td>string</td>
<td>new SPEntryPage().getFirstPageURL()</td>
<td>First page after authentication</td>
</tr>
</tbody>
</table>

getFirstPageURL primarily does the following:

- Redirects to login_redirect.do in order to break out of the frameset (if there is one).
- Redirects to Service Portal if the user has no roles, or the full platform for everyone else.

2. Customize the after login behavior by navigating to the SPEntryPage script include.

**Note:** If you make changes to the script include, it won't be upgraded with future updates.

**Note:** If you are using external authentication, ensure that your IdP supports the RelayState URL parameter. This parameter retains the originally requested URL while the user authenticates, and is necessary for redirection after login.

Debug Service Portal URL redirects

Debug the URL redirects for logging in to Service Portal and redirecting to the first page.

To view debug output from SPEntryPage and see the session variables it redirects based on:

1. Make sure the system property glide.entry.first.page.script has the value: new SPEntryPage().getFirstPageURL().
2. From the SPEntryPage script include, set this.logVariables = true.
3. In a separate browser, log in.
4. From the system navigator, view the log output by navigating to System Logs System Log All.

Configure page security by role

Set up pages to be public or filter them by role.

Public pages won’t require a user login; anyone can access them. All other options require user authentication.

To manage your page security:

1. In the Service Portal configuration page (Service Portal Service Portal Configuration), open the Page Editor.
2. In the Select Page list, search for the page you want to apply page security to.
3. Select the highest level node in the tree view.
4. To make a page public, select the Public check box. All users can access pages marked as Public.
5. To limit access to a certain role, add roles in a comma separated list. Users without the role listed can see links to the page if they appear in the portal. Trying to open the page results in a page not found error.

**Note:** If you select Public and add a list of roles, the page is still accessible by any user.
6. To create a draft page that only administrators can see while the page is still in development, select Draft. Users must have the admin role to see any pages in draft. Everyone else sees a page not found error.

![Doc Page](image)

Figure 632: Page with limited access by role

User criteria for Service Portal

User criteria enables you to allow access to users based on role, department, group, location, or company. Administrators can control access to pages, widgets, widget instances, announcements, and search sources in a portal by creating and applying user criteria.

User criteria records define conditions that are evaluated against user records. When user criteria is defined, portal records are only visible to users who pass the defined conditions.

User criteria is a platform feature used in Service Portal. Learn more about user criteria in the Now Platform:
- Service Catalog: *Set security for items and categories.*
- Knowledge management: *Select user criteria for a knowledge base* on page 1400.

**Converting role-based permissions to user criteria records**

User criteria in Service Portal replaces role-based permissions. After activating the user criteria for Service Portal plugin, you must *Set the user criteria for Service Portal system property* on page 2886 to true. When the system property is set to true, any existing roles defined for a page, widget, or search source are automatically converted into user criteria records. To disable user criteria and continue using role-based permissions, set the system property to false.

**User criteria checks**

User criteria uses the following checks in Service Portal to verify user access.

![User criteria checks diagram](image)

**Page access user criteria**

The following diagram shows how the system decides whether a user can access a page based on user criteria.
The following diagram shows how the system determines whether a user has access to a particular widget or widget instance.

Widget access user criteria
Activate the user criteria for Service Portal plugin

You can activate the Service Portal User Criteria Support plugin (com.glide.service-portal.user-criteria) if you have the admin role.

Role required: admin

1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.
   - If the plugin depends on other plugins, these plugins are listed along with their activation status.
   - If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).
4. If available, select the Load demo data check box.
   - Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.
   - You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.
5. Click Activate.

Set the user criteria for Service Portal system property

After activating the Service Portal User Criteria Support plugin, you must set the system property to true.

Role required: admin

Setting the system property activates user criteria for Service Portal. When the system property is set to true, any existing roles defined for a page, widget, or search source are automatically converted into user criteria records. To disable user criteria and continue using role-based permissions, set the system property to false.

1. Navigate to Service Portal Properties.
2. Click the check box to set the following property to true.

Enable use of User Criteria records instead of Roles fields for Service Portal entitlements

Defines permissions for Service Portal widgets, widget instances, search sources and pages

☐ Yes | No

3. Click Save.

Create a user criteria record for Service Portal

Create a user criteria record to apply to items in Service Portal and control user access to pages, widgets, widget instances, and search sources.

You can apply existing user criteria to records in Service Portal through Service Portal configuration (Service Portal Service Portal configuration). You can only create user criteria within the platform UI.

1. In the navigation filter, type Service Portal.
2. Select a page, widget, or widget instance record.

3. In the related list at the bottom of the record, select the Can View or Cannot View tab, then click New. If a user criteria record is already created, you can click Edit to apply user criteria to the page, widget, or widget instance.

User criteria records are stored in the user_criteria table.

4. Complete the fields on the form, as appropriate.

Table 1164: Service Portal User Criteria

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the criteria record.</td>
</tr>
<tr>
<td>Users</td>
<td>User records to match access criteria.</td>
</tr>
<tr>
<td>Groups</td>
<td>Group records to match access criteria.</td>
</tr>
<tr>
<td>Roles</td>
<td>Roles to match access criteria.</td>
</tr>
<tr>
<td>Advanced</td>
<td>Displays or hides the Script field.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Script</td>
<td>Defines any additional criteria, and returns true or false. This field is available only if Advanced is selected.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Because scripts are evaluated dynamically, including scripts in user criteria records can decrease performance.</td>
</tr>
<tr>
<td>Application</td>
<td>Application scope for the user criteria record.</td>
</tr>
<tr>
<td>Active</td>
<td>Activate or deactivates this criteria record.</td>
</tr>
<tr>
<td>Companies</td>
<td>Companies to match access criteria.</td>
</tr>
<tr>
<td>Locations</td>
<td>Locations to match access criteria.</td>
</tr>
<tr>
<td>Departments</td>
<td>Departments to match access criteria.</td>
</tr>
<tr>
<td>Match All</td>
<td>Determines whether all elements from each populated criteria field must match. If selected, only users who match all criteria are given access.</td>
</tr>
<tr>
<td></td>
<td>If cleared, the user must meet one or more of the set criteria to be given access.</td>
</tr>
<tr>
<td></td>
<td>By default, this check box is cleared so that any condition met provides a match.</td>
</tr>
<tr>
<td></td>
<td>For example, consider a user criteria record for the following:</td>
</tr>
<tr>
<td></td>
<td>- Locations A or B</td>
</tr>
<tr>
<td></td>
<td>- Company C or D</td>
</tr>
<tr>
<td></td>
<td>With Match All selected, only users meeting all these conditions are matched. For example, a user with a location A and a company C.</td>
</tr>
<tr>
<td></td>
<td>With Match All cleared, users meeting any of these conditions are matched. For example, a user with a location B.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> If you select Match All, ensure that you do not create contradictory conditions that can never be met. For example, if all users in location A work for company G, then the conditions in this example can never be met.</td>
</tr>
</tbody>
</table>

5. Click Submit.
Apply user criteria to a page, widget, or widget instance

Assign user criteria to pages, widgets, or widget instances to limit user access to content in a portal. You can apply several user criteria records to a single portal item.

1. In the Service Portal Configuration page (Service Portal Service Portal Configuration), open the Page Editor.
2. Select a page from the list.
3. Select a page, widget, or widget instance node from the page tree.
4. Under related lists, click Who Can View or Who Cannot View.
5. Click New.
6. Select a criteria from the Can View or Cannot View list.
   Selecting criteria from the Can View or Cannot View list applies user criteria records created in Create a user criteria record for Service Portal on page 2886 to the selected page, widget, or widget instance.

7. Click Save.
Apply user criteria to a search source

Assign user criteria to search sources to limit user access to content in a portal.

Role required: admin

You can add user criteria to custom or default Service Portal search on page 2856.

1. In the Service Portal Configuration page (Service Portal Service Portal Configuration), navigate to Portal Tables Search Source in the header menu.
Service Portal
Create rich, engaging and modern experiences to help your business run.
Select one of the options below to continue.

- **Branding Editor**: Customize your portal's title, logo and theme colors. Preview changes as you make them.
- **Designer**: Create and layout pages with drag-and-drop functionality. Preview pages as you make changes.
- **Page Editor**: Configure the properties of pages, containers and widgets from a map view.
- **Widget Editor**: Create widgets from scratch or customize an existing one. Write HTML, CSS, and JavaScript with real-time preview.
- **Search Source**: Search for content related to the portal.
2. Open the search source record that you would like to modify.
3. Under related lists, click Who Can View Search Sources or Who Cannot View Search Sources.
4. Click New.
5. Select a criteria from the Can View or Cannot View list.
   Selecting criteria from the Can View or Cannot View list applies user criteria records created in Create a user criteria record for Service Portal on page 2886 to the selected search source.

6. Click Save.

Enable e-signature for Service Portal

You can configure e-signature in Service Portal to require re-authentication from approving users.

Role required: admin

2. Navigate to System Definition e-Signature Registry.
3. Add any tables you want to require an e-signature for to the list.
With e-signature enabled, approvers are required to provide a password to approve or reject any requests. Authentication with touch ID works in the mobile app. On the mobile web, approvers are still required to enter a password. For more information on configuring e-signature, see Approval with e-signature on page 2418.

Service Portal SCSS Primer

SCSS is a subset of the Syntactically Awesome StyleSheets (Sass) specification and is an extension of CSS. Every valid CSS style sheet is valid SCSS.

SCSS variables

SCSS variables are a way to store information that you want to reuse throughout your style sheet. You can store things like colors, font stacks, or any CSS value you think you want to reuse. SCSS uses the $ symbol to make something a variable.

SCSS supports the follow data types:

- Numbers (including units)
- Strings (with quotes or without)
- Colors (name, or names)
- Booleans

Variables can also be arguments to or results from one of several available functions or mixins. During translation, the values of the variables are inserted into the output CSS document.

For example:

```scss
$font-stack:    Helvetica, sans-serif;
$primary-color: #333;

body {
  font: 100%$font-stack;
  color: $primary-color;
}
```

For more information on Sass, see the Sass/SCSS reference.

SCSS functions

List of functions for Service Portal SCSS compiler.

**RGB functions**

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>rgb($red, $green, $blue)</td>
<td>Creates a Color from red, green, and blue values.</td>
</tr>
<tr>
<td>rgba($red, $green, $blue, $alpha)</td>
<td>Creates a Color from red, green, blue, and alpha values.</td>
</tr>
<tr>
<td>red($color)</td>
<td>Gets the red component of a color.</td>
</tr>
<tr>
<td>green($color)</td>
<td>Gets the green component of a color.</td>
</tr>
<tr>
<td>blue($color)</td>
<td>Gets the blue component of a color.</td>
</tr>
<tr>
<td>Function</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>mix($color1, $color2, [$weight])</td>
<td>Mixes two colors together.</td>
</tr>
</tbody>
</table>

### HSL functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>hsl($hue, $saturation, $lightness)</td>
<td>Creates a Color from hue, saturation, and lightness values.</td>
<td>Yes</td>
</tr>
<tr>
<td>hsla($hue, $saturation, $lightness, $alpha)</td>
<td>Creates a Color from hue, saturation, lightness, and alpha values.</td>
<td>Yes</td>
</tr>
<tr>
<td>hue($color)</td>
<td>Gets the hue component of a color.</td>
<td>Yes</td>
</tr>
<tr>
<td>saturation($color)</td>
<td>Gets the saturation component of a color.</td>
<td>Yes</td>
</tr>
<tr>
<td>lightness($color)</td>
<td>Gets the lightness component of a color.</td>
<td>Yes</td>
</tr>
<tr>
<td>adjust-hue($color, $degrees)</td>
<td>Changes the hue of a color.</td>
<td>Yes</td>
</tr>
<tr>
<td>lighten($color, $amount)</td>
<td>Makes a color lighter.</td>
<td>Yes</td>
</tr>
<tr>
<td>darken($color, $amount)</td>
<td>Makes a color darker.</td>
<td>Yes</td>
</tr>
<tr>
<td>saturate($color, $amount)</td>
<td>Makes a color more saturated.</td>
<td>Yes</td>
</tr>
<tr>
<td>desaturate($color, $amount)</td>
<td>Makes a color less saturated.</td>
<td>Yes</td>
</tr>
<tr>
<td>grayscale($color)</td>
<td>Converts a color to grayscale.</td>
<td>Yes</td>
</tr>
<tr>
<td>complement($color)</td>
<td>Returns the complement of a color.</td>
<td>No</td>
</tr>
<tr>
<td>invert($color)</td>
<td>Returns the inverse of a color.</td>
<td>No</td>
</tr>
</tbody>
</table>

### Opacity functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>alpha($color)</td>
<td>Gets the alpha component (opacity) of a color.</td>
<td>Yes</td>
</tr>
<tr>
<td>opacity($color)</td>
<td>Gets the alpha component (opacity) of a color.</td>
<td>Yes</td>
</tr>
<tr>
<td>rgba($color, $alpha)</td>
<td>Changes the alpha component for a color.</td>
<td>Yes</td>
</tr>
<tr>
<td>opacify($color, $amount)</td>
<td>Makes a color more opaque.</td>
<td>No</td>
</tr>
<tr>
<td>fade-in($color, $amount)</td>
<td>Makes a color more opaque.</td>
<td>No</td>
</tr>
</tbody>
</table>
### Other color functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>transparentize($color, $amount)</td>
<td>Makes a color more transparent.</td>
<td>No</td>
</tr>
<tr>
<td>fade-out($color, $amount)</td>
<td>Makes a color more transparent.</td>
<td>No</td>
</tr>
</tbody>
</table>

### String functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>unquote($string)</td>
<td>Removes quotes from a string.</td>
<td>Yes</td>
</tr>
<tr>
<td>quote($string)</td>
<td>Adds quotes to a string.</td>
<td>Yes</td>
</tr>
<tr>
<td>str-length($string)</td>
<td>Returns the number of characters in a string.</td>
<td>No</td>
</tr>
<tr>
<td>str-insert($string, $insert, $index)</td>
<td>Inserts $insert into $string at $index.</td>
<td>No</td>
</tr>
<tr>
<td>str-index($string, $substring)</td>
<td>Returns the index of the first occurrence of $substring in $string.</td>
<td>No</td>
</tr>
<tr>
<td>str-slice($string, $start-at, [$end-at])</td>
<td>Extracts a substring from $string.</td>
<td>No</td>
</tr>
<tr>
<td>to-upper-case($string)</td>
<td>Converts a string to upper case.</td>
<td>No</td>
</tr>
<tr>
<td>to-lower-case($string)</td>
<td>Converts a string to lower case.</td>
<td>No</td>
</tr>
</tbody>
</table>
Number functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>percentage($number)</td>
<td>Converts a unitless number to a percentage.</td>
<td>Yes</td>
</tr>
<tr>
<td>round($number)</td>
<td>Rounds a number to the nearest whole number.</td>
<td>Yes</td>
</tr>
<tr>
<td>ceil($number)</td>
<td>Rounds a number up to the next whole number.</td>
<td>Yes</td>
</tr>
<tr>
<td>floor($number)</td>
<td>Rounds a number down to the previous whole number.</td>
<td>Yes</td>
</tr>
<tr>
<td>abs($number)</td>
<td>Returns the absolute value of a number.</td>
<td>Yes</td>
</tr>
<tr>
<td>min($numbers…)</td>
<td>Finds the minimum of several numbers.</td>
<td>Yes</td>
</tr>
<tr>
<td>max($numbers…)</td>
<td>Finds the maximum of several numbers.</td>
<td>Yes</td>
</tr>
<tr>
<td>random([$limit])</td>
<td>Returns a random number.</td>
<td>No</td>
</tr>
</tbody>
</table>

List functions

Lists in SCSS are immutable. All list functions return a new list rather than updating the existing list in-place.

All list functions work for maps as well, treating them as lists of pairs.

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>length($list)</td>
<td>Returns the length of a list.</td>
</tr>
<tr>
<td>nth($list, $n)</td>
<td>Returns a specific item in a list.</td>
</tr>
<tr>
<td>set-nth($list, $n, $value)</td>
<td>Replaces the nth item in a list.</td>
</tr>
<tr>
<td>join($list1, $list2)</td>
<td>Joins two lists into one.</td>
</tr>
<tr>
<td>append($list1, $val)</td>
<td>Appends a single value onto the end of a list.</td>
</tr>
<tr>
<td>zip($lists…)</td>
<td>Combines several lists into a single multidimensional list.</td>
</tr>
<tr>
<td>index($list, $value)</td>
<td>Returns the position of a value within a list.</td>
</tr>
<tr>
<td>list-separator($list)</td>
<td>Returns the separator of a list.</td>
</tr>
</tbody>
</table>

Adding custom functions

Scss @function my-calculation-function($some-number, $another-number){ @return $some-number + $another-number }
SCSS nesting

SCSS lets you nest your CSS selectors in a way that follows the same visual hierarchy of your HTML.

For example:

```css
nav {
  ul {
    margin: 0;
    padding: 0;
    list-style: none;
  }

  li { display: inline-block; }

  a {
    display: block;
    padding: 6px 12px;
    text-decoration: none;
  }
}
```

The ul, li, and a selectors are nested inside the nav selector, which is a great way to organize your CSS and make it more readable. When the widget is rendered, the generated CSS looks something like the following code block:

```css
nav ul {
  margin: 0;
  padding: 0;
  list-style: none;
}

nav li {
  display: inline-block;
}

nav a {
  display: block;
  padding: 6px 12px;
  text-decoration: none;
}
```

For more information on Sass, see the [Sass/SCSS reference](#).

SCSS operators

SCSS has a handful of standard math operators like +, -, *, /, and %.

Use simple math to calculate widths for an aside & article. For example:

```css
.container { width: 100%; }

article[role="main"] {
  float: left;
  width: 600px / 960px * 100%;
}

aside[role="complementary"] {
  float: right;
  width: 300px / 960px * 100%;
}
```

The generated CSS looks like:
For more information on Sass, see the Sass/SCSS reference.

SCSS mixins

A mixin lets you make groups of CSS declarations that you want to reuse throughout your site. You can pass in values to make your mixin more flexible.

The following code block is an example for border-radius.

```scss
@mixin border-radius($radius) {
  -webkit-border-radius: $radius;
  -moz-border-radius: $radius;
  -ms-border-radius: $radius;
  border-radius: $radius;
}

.box { @include border-radius(10px); }
```

The generated CSS looks like:

```css
.box {
  -webkit-border-radius: 10px;
  -moz-border-radius: 10px;
  -ms-border-radius: 10px;
  border-radius: 10px;
}
```

For more information on Sass, see the Sass/SCSS reference.

Subscription Management

With the ServiceNow® Subscription Management application, review and manage how your ServiceNow subscriptions are used on your production instance. Subscriptions are downloaded to production instances only and not to development or QA instances.

Explore

- Subscription Management release notes
- Upgrade to London
- Domain separation in Subscription Management on page 2900

Set up

- Video: Getting Started with Subscription Management
- Subscription Management setup guide on page 2899

Administer

- Subscription Management admin guide on page 2900
- Allocating users to a Per-User subscription on page 2909
- View your subscription applications and allocation levels on page 2901
Use

- Allocating users to a Per-User subscription on page 2909
- Build a subscription user set on page 2912
- Add a user set to a subscription on page 2913
- Allocate an individual user from the Subscription form on page 2914
- Unsubscribe a user on page 2917

Troubleshoot and get help

- Ask or answer questions in the Subscription community
- Search the HI Knowledge Base for known error articles
- Contact ServiceNow Support

Subscription Management setup guide

Because Subscription Management is active for all production instances by default, you do not need to activate a plugin. To set up Subscription Management, you assign the usage_admin role to the users who will administer subscriptions. The admins allocate users to appropriate subscriptions, monitor usage of applications (both by subscribed users and by users who are not subscribed), and update subscription levels as needed.

What to do

Assign the Usage Admins

Before you (the admin user) do anything else, assign the usage_admin role to the persons who will manage subscriptions for your organization.

Admin responsibilities and activities are described in Allocating users to a Per-User subscription on page 2909 and Monitoring how subscriptions are allocated on page 2917.

View the list of your subscription applications

See View your subscription applications and allocation levels on page 2901.

If your organization purchased Per-User subscriptions, the usage_admin allocates users

**Note:** You perform this task only for Per-User subscriptions. Your instance auto-allocates and reports on monthly usage for all other subscription types.

With a Per-User subscription, a specified number of users is entitled to use the application. You perform the following tasks:

- Build user sets.
- Allocate users to appropriate subscriptions.
• Monitor whether you have allocated the right number of users.
• Monitor and manage how users are allocated.

See Allocating users to a Per-User subscription on page 2909.

What to do next

Day-to-day administration: Monitor and manage subscriptions
See Monitoring how subscriptions are allocated on page 2917.

Domain separation in Subscription Management

This is an overview of domain separation in Subscription Management. Domain separation is not supported in this application. For more information, see Application support for domain separation.

Overview

Domain separation is not supported in this application. For more information, see Application support for domain separation.

Subscription Management admin guide

You use the ServiceNow® Subscription Management application to review and manage how purchased subscriptions are used on your production instance. You can monitor usage of subscription applications to update subscription levels and to make informed decisions about subscription purchases.

What is a subscription?

In contrast to companies that sell software licenses, ServiceNow sells subscription services.

• Your organization has purchased a subscription to an application family. The subscription entitles an agreed-upon number of users or resources in your organization to use the applications.
• For Per-User type subscriptions only, you allocate users to the subscription. As a result, the user is subscribed to the family of applications. For other subscription types, the instance auto-allocates users or resources to the subscription.
• For your organization to comply with its service contract, only subscribed users or resources should use a subscription application family.
• The Subscription Management application monitors your purchased subscriptions on production instances only.

How do you use Subscription Management?

The usage_admin can perform the following tasks:

• Receive and view subscriptions that your organization has purchased.
- Monitor and adjust allocation levels.
- Plan for renewing subscriptions.
- Determine which users (by role, by user group, or by some other criterion) should be subscribed to which Per-User subscription applications.
- Build user sets.
- Allocate users and user sets to each of the Per-User subscriptions.
- Manage user sets as users, roles, and groups change over time.

**View your subscription applications and allocation levels**

The Subscriptions page lists the subscriptions that your organization has purchased and indicates how many users or resources are allocated to each subscription.

Role required: usage_admin or admin

The page lists only subscriptions that are currently active (have not expired). To view expired subscriptions as well, set the list filter to All.

1. On your production ServiceNow instance, navigate to Subscription Management Subscriptions.
   - The page attempts to list all subscriptions that your organization has purchased. Some subscriptions do not appear. See *Why a subscription might not appear in the list* on page 2905.
   - A color code indicates the allocation level (the number of resources that are subscribed to the application).
   - Headings on the Subscriptions list are described in *Subscription form* on page 2902.

![Subscriptions page](image)

2. You can click a subscription Name to open the Subscription form, where you can:
   - View or update how users are allocated to a Per-User subscription. See *Subscription form* on page 2902
Subscription form

Use the Subscription form to view the list of applications that are associated with the subscription and to view or update how resources are allocated to a subscription.

In any list of subscriptions, click a subscription Name to open the Subscription form. Some fields do not appear for ServiceNow Store applications.

**Note:** For information on why a subscription is not in the list, see *Why a subscription might not appear in the list* on page 2905.

**Table 1165: Fields on the Subscription form**

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the subscription.</td>
</tr>
<tr>
<td>Type</td>
<td>Type of subscription: Per-User, Max User, PA Indicator, Capacity, or Unlimited. See <em>Types of subscriptions</em> on page 2905.</td>
</tr>
<tr>
<td>Category</td>
<td>The source of the purchased subscription: ServiceNow or ServiceNow Store.</td>
</tr>
<tr>
<td>Start date / End date</td>
<td>Start and end of the subscription period as agreed in your service contract. This information appears in the General section of the service contract for the subscription.</td>
</tr>
<tr>
<td>Display only</td>
<td>A value of true indicates that user allocation or monitoring is not currently supported for the subscription.</td>
</tr>
<tr>
<td>Cost</td>
<td>Denotes whether the subscription is For-fee or Free. Some ServiceNow Store apps are free. You do not allocate resources to free subscriptions.</td>
</tr>
<tr>
<td>Purchased</td>
<td>Number of users or other resources that can be subscribed.</td>
</tr>
<tr>
<td>Allocated</td>
<td>Number of currently subscribed users or allocated resources for the subscription. The color codes indicate the percentage of the subscription that is used. See <em>Configure the color codes for subscription allocation levels</em> on page 2922.</td>
</tr>
<tr>
<td>Field</td>
<td>Value</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Limit to purchased</td>
<td>Note: The admin role is required to change this setting. Select the check box to ensure that you do not exceed the purchased subscription limit while attempting to allocate users. The setting affects whether you can use the Allocate selected users button for users in the Pending state.</td>
</tr>
<tr>
<td></td>
<td>When allocation would result in exceeding the purchased subscription limit, the following conditions apply:</td>
</tr>
<tr>
<td></td>
<td>• Limit to purchased selected: You cannot apply the Allocate selected users button on the Pending Users related list.</td>
</tr>
<tr>
<td></td>
<td>• Limit to purchased not selected: You can apply the Allocate selected users button on the Pending Users related list. The color code on the Allocated field changes to red to indicate over-allocation.</td>
</tr>
<tr>
<td>Auto-sync user sets</td>
<td>Select the check box to periodically verify all associated user sets for updates (added or removed users) and then update subscription allocation accordingly. The verification process is based on the user set membership settings.</td>
</tr>
<tr>
<td></td>
<td>Note: If adding a user exceeds the subscription limit, then the following actions happen:</td>
</tr>
<tr>
<td></td>
<td>• The user is not subscribed.</td>
</tr>
<tr>
<td></td>
<td>• The user is set to the Pending state.</td>
</tr>
<tr>
<td></td>
<td>• The user is listed on the Pending Users related list.</td>
</tr>
</tbody>
</table>

**Related links on the Subscription form**

- Subscription histories
- Histories of subscription users
- Histories of subscription user sets

For details, see *View Subscription Management history reports* on page 2907.
## Related lists on the Subscription form

<table>
<thead>
<tr>
<th>List</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subscribed Users</td>
<td>This list of users that are subscribed to the applications is populated only for Per-User subscriptions. The users were allocated to the subscription individually, are members of user sets, or both.</td>
</tr>
<tr>
<td>User Sets</td>
<td>User sets that were added to the subscription.</td>
</tr>
<tr>
<td>Excluded Users</td>
<td>Appears only if there are users in the Excluded state.</td>
</tr>
<tr>
<td></td>
<td>Excluded users cannot be allocated to the subscription. See <a href="#">Exclude a user from a subscription</a> on page 2917 and <a href="#">Remove a user from the Excluded list</a> on page 2917.</td>
</tr>
<tr>
<td>Subscription Applications</td>
<td>Applications or application families that are associated with the subscription. Users that you allocate to the subscription are subscribed to the listed applications. To view the list of plugins that are associated with an application, click the application name.</td>
</tr>
<tr>
<td>Associated Roles</td>
<td>Lists all roles that are loaded with the plugin for the application. You might use the roles that are identified as associated roles to construct a user set. See <a href="#">Build a subscription user set</a> on page 2912.</td>
</tr>
<tr>
<td>Pending Users</td>
<td>Appears only if there are users in the Pending state.</td>
</tr>
<tr>
<td></td>
<td>When you try to allocate users to a subscription but the subscription limit would be exceeded, the users are not subscribed and are set to the Pending state. You can deallocate some users and allocate other users to the subscription. See <a href="#">Manage users in the Pending state</a> on page 2916.</td>
</tr>
<tr>
<td>List</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Entitlements</td>
<td>List of entitlements that are included with the subscription. An entitlement is a feature that is part of the application (for example, the Employee Relations or Payroll feature in the HR application). For subscription applications, your organization can buy some entitlements and not buy others. The entitlements that appear in the list are the entitlements that your organization purchased with the subscription application. The Entitlements related list appears only for subscription applications that implement entitlements. Not all applications implement entitlements.</td>
</tr>
</tbody>
</table>

*Why a subscription might not appear in the list*

The Subscriptions list displays the subscriptions that your organization has purchased. There are, however, several types of non-subscription items that do not appear in the list.

*Why does my subscription not appear in the Subscriptions list?*

- You might not see all subscription services that you have purchased because the Subscription Management application does not yet allow management of some subscription services.
- The subscription may have expired. The page lists only subscriptions that are currently active. To view expired subscriptions as well, set the list filter to All.
- Subscription data arrives on production instances only.
- Self-hosted instances do not receive subscription information.
- Subscriptions that are marked as Display only do not currently support resource allocation or monitoring.

*Why is the Subscriptions list empty?*

- The subscription information might not yet have arrived. The data is downloaded daily.

*Types of subscriptions*

The Subscriptions module lists all subscription types that your organization has purchased.

You allocate users only to Per-User subscriptions. Because the instance auto-allocates all other subscription types, no action is required on your part.
### Table 1166: Subscription types in the Subscriptions list

<table>
<thead>
<tr>
<th>Subscription type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>Your ServiceNow instance auto-allocates resources such as users, devices, software, or nodes to Capacity subscriptions. For example, resources like each CI that Discovery finds or each password reset request.</td>
</tr>
<tr>
<td>Max User</td>
<td>Your organization purchased a subscription for the anticipated maximum number of active ServiceNow users. To monitor overall usage, the instance auto-allocates each active user up to the limit of the Max User subscription.</td>
</tr>
<tr>
<td>PA Indicator</td>
<td>Your organization purchased a subscription for an application family that uses Performance Analytics capabilities (for example, PA for ITSM or PA for Service Management). The PA admin creates indicators on tables that are used by the applications.</td>
</tr>
<tr>
<td>Per-User</td>
<td>Your organization purchased a subscription for the number of fulfiller users for subscription applications and capabilities. By default, the instance can monitor and report on usage of the application by both subscribed users and users who are not subscribed. See Allocating users to a Per-User subscription on page 2909.</td>
</tr>
<tr>
<td>Unlimited</td>
<td>ServiceNow Store apps only. Your instance auto-allocates and tracks active users to an Unlimited subscription. There is no limit to the number of users that can be allocated. An active user is any user in the sys_user table that has a user id and has the Active field set to true.</td>
</tr>
</tbody>
</table>

**View the applications and plugins that are included with a subscription**

You can activate a plugin that is associated with a for-fee subscription only if your organization has purchased the subscription.

**Role required:** usage_admin or admin

1. On your production ServiceNow instance, navigate to Subscription Management Subscriptions. The page lists all active subscriptions for your organization. If a subscription does not appear in the list, contact your ServiceNow account representative to purchase the subscription. Some subscriptions do not appear for other reasons. See Why a subscription might not appear in the list on page 2905.

2. Click a subscription name and then, on the Subscription form, click an application name in the Subscription Applications related list. (A subscription can include multiple applications.) The page lists the plugins that are associated with the application.
View the roles that are associated with the plugin for a subscription application

The Application Roles related list includes all roles that are loaded with the plugin for an application. The roles in the list form a good basis for constructing a user set.

Role required: usage_admin or admin

<table>
<thead>
<tr>
<th>Associated Roles</th>
<th>Go to Application</th>
<th>Requires Subscription</th>
</tr>
</thead>
<tbody>
<tr>
<td>asset</td>
<td>Asset Management</td>
<td>Yes</td>
</tr>
<tr>
<td>category_manager</td>
<td>Asset Management</td>
<td>Yes</td>
</tr>
<tr>
<td>contract_manager</td>
<td>Asset Management</td>
<td>Yes</td>
</tr>
<tr>
<td>financial_mgmt_admin</td>
<td>Asset Management</td>
<td>Yes</td>
</tr>
<tr>
<td>financial_mgmt_user</td>
<td>Asset Management</td>
<td>Unspecified</td>
</tr>
</tbody>
</table>

1. On your production ServiceNow instance, navigate to Subscription Management Subscriptions, and then click a subscription name.
   The Application Roles related list includes all roles that are loaded with the plugin for an application. The fulfiller type roles in the list that are subscription roles form a good basis for constructing a user set.

2. Use the list as a basis for creating a user set.

View Subscription Management history reports

History reports give the usage_admin at-a-glance status and trends on subscription activity for an organization.

Role required: usage_admin or admin

1. Follow the How to instructions in the table.
**Table 1167: History reports**

<table>
<thead>
<tr>
<th>Report</th>
<th>Description</th>
<th>How to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subscription histories</td>
<td>Concise data on subscription downloads and updates for your organization.</td>
<td>1. Navigate to Subscription Management Subscriptions and then click a subscription Name.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. On the Subscription form, click the View Subscription History related link.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. The Subscription History pop-up lists the operations on subscriptions for this ServiceNow instance. Click an Operation to view details.</td>
</tr>
<tr>
<td>Histories of subscription users</td>
<td>For each Per-User subscription, concise historical data on changes in subscription state for users: when users were subscribed and when they were unsubscribed, excluded, or unexcluded.</td>
<td>1. Navigate to Subscription Management Subscriptions and then click the Name of a Per-User subscription.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. On the Subscription form, click the View User Subscription History related link.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. The User Subscription History pop-up lists the operations on user subscription state for the specified subscription. Click a User State to view details of a change in subscription state for a user.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• User State: Lists the change in the user state: subscribed/unsubscribed and excluded/unexcluded.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Allocation Source: Lists the name of the user set that acted as the source of the user.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Allocation Type: Lists the method for allocating the user to the subscription: user set or individual.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Operation time and Created by: Lists the timestamp of change and the admin who made the change.</td>
</tr>
<tr>
<td>Histories of subscription user sets</td>
<td>Data on when subscription user sets were created, updated, or deleted.</td>
<td>1. Navigate to Subscription Management Subscription User Sets and then click the Name of a user set.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. On the Subscription User Set page, click the View User Set History related link.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. The User Set History pop-up lists the operations on user sets for the specified subscription. Click an Operation to view details.</td>
</tr>
</tbody>
</table>
2.

Allocating users to a Per-User subscription
You use the Subscriptions module to allocate users to all Per-User subscriptions that your organization has purchased.

Example: allocate users to a Per-User subscription
In this example, your organization purchased a subscription for 200 fulfiller users. You, the usage admin, can therefore specify the 200 users—the subscribed users—who have the right to use the application family on your production instance. You can allocate users either individually or by adding user sets to the subscription.

Note: User sets are the preferred automated method for managing the pool of users who are allocated to a subscription. Once you configure and allocate a user set, the system regularly updates the list of members based on the conditions that you specified. You do not need to manage individual users.
Allocating users to a Per-User subscription

1. The subscription admin allocates a mix of user sets and individual users to the 200-user subscription.

2. The 200 users that the admin allocated to the subscription are now subscribed.

User Set 1
- Allocate
- 130 users

User Set 2
- Allocate
- 65 users

5 Individual Users

ServiceNow subscription app

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Guidelines for allocating users

- You allocate users only to Per-User subscriptions. The instance auto-allocates and reports on monthly usage for all other subscription types.
- When you add a user set to a subscription, the system allocates all users in the user set, up to the purchased subscription limit.
- In the case that adding the users in a user set would exceed the subscription limit, then none of the users in the user set are subscribed. Instead, all users in the user set are set to the Pending state and are listed on the Pending Users related list. Users that are currently subscribed are not affected. See Manage users in the Pending state on page 2916.
- You can unsubscribe any user as needed.
- You can exclude users. Excluded users cannot be allocated to a subscription individually or through a user set. At any time, you can remove a user from the list of excluded users.

Note: If you unsubscribe a user who is a member of a user set that is associated with an auto-synced subscription, the user will be resubscribed in the next synchronization cycle. To remove such a user, exclude the user. See Exclude a user from a subscription on page 2917.

Methods for allocating users

- Define user sets and then add user sets to the subscription
- Allocate individual users to the subscription (as many as are required)

Overview of the procedure for allocating users

1. Allocate users to the subscription using one or both of the following methods:
   - Build one or more user sets and add the user sets to the subscription
   - Allocate individual users

2. After you have allocated users to the subscription, you can add or remove user sets and individual users as needed. In addition, you can exclude individual users as needed.

Subscription user sets

User sets make it easy to specify which users should be allocated to a subscription. You can use roles, user groups, or both roles and groups as the conditions for a user to be a member of a user set (for example, everyone with the fulfiller role in the "IT department" group).

Auto-sync

When you add a user set to a subscription, the system attempts to subscribe all users in the user set. The system updates the members in a user set whenever a user update causes the user to meet or fail to meet the criteria for the user set. For example, if a user loses the "fulfiller user" role, the user is removed from the user set.

To make subscriptions self-maintaining, you can auto-sync a subscription. The system then regularly subscribes or unsubscribes users based on updates to the user sets that are assigned to the subscription. The option is described in Auto-sync a subscription to user set updates on page 2913.
How users are subscribed and unsubscribed

- When you add a user set to a subscription, the system allocates all users in the user set to the subscription, up to the purchased subscription limit.
- You can add a user set to any number of subscriptions.
- Users that are allocated from multiple user sets are subscribed only one time.
- In the case that adding the users would exceed the subscription limit, then none of the users in the user set are subscribed. Instead, all users in the user set are set to the Pending state and are listed in the Pending Users related list.
- When you remove a user set from a subscription, the system attempts to unsubscribe all users in the set. If a user is added from another user set, however, the user is not unsubscribed.
- Users that the usage admin has flagged as excluded are not allocated, even if other members of the user set are allocated. The usage admin can unexclude a user so that the user can be allocated.

Why a user is not subscribed when you add a user set

- The user set is empty (contains no users).
- The user had been excluded from the subscription.
- The user had already been directly allocated
- Another user set added the user (duplicate user)
- A user could not be allocated because adding the user would exceed the subscription limit. In this case, all users in the user set are set to the Pending state. The names of the users are listed in the Pending Users related list.

Why a user is not unsubscribed when you remove a user set

- The user set is empty (contains no users).
- The user was already directly allocated
- The user is added from another user set

Build a subscription user set

You can create a user set using either or both of two methods: Configure a filter (for example, filter by role) that selects particular users from the User [sys_user] table or specify a particular set of user groups from the Group [sys_user_group] table.

Role required: usage_admin or admin

1. Navigate to Subscription Management Subscription User Sets.
2. On the Subscription User Sets page, click New and then enter a unique Name (for example, Fulfiller users in the IT department) and Description for the user set.
3. To specify a user set by filtering users:
   a) In the Source field, select User [sys_user].
   b) Specify the filters that determine which users to extract from the table. The extracted users make up the user set. For example, filter for [role] [is] [itil]. The Conditions setting is a standard ServiceNow condition builder.
Tip: The Application Roles related list on the Subscriptions page includes all roles that are loaded with the plugin for the application. The roles in the list [that are identified as Subscription roles] form a good basis for constructing a user set. See View the roles that are associated with the plugin for a subscription application on page 2907.

c) Click ( ) to view the number of users that the filter generates. Members of the user set appear in the Subscription User Set Members related list.

4. To specify a user set based on user groups that should be included in the set:
   a) In the Source field, select Group [sys_user_group]
   b) Unlock the Groups box and add appropriate groups.
   c) Click ( ) to view the number of users that the filter generates. Members of the user set appear in the Subscription User Set Members related list.

5. When the Subscription User Set Members related list is correct, click Submit or Update. The user set that you created is available to add to any subscription.

Add a user set to a subscription
When you add a user set to a subscription, all users in the user set are allocated to the subscription.

Role required: usage_admin or admin

1. Navigate to Subscription Management Subscriptions.
2. Click the Name of the Per-User subscription to allocate users to.
3. On the User Sets related list, click Edit.
4. The Add User Sets form displays the list of user sets that you can add. Move the desired user sets from the Collection list into the User Sets list and then click Save. The users in the list are allocated to the subscription and the number of subscribed users is updated.

Note: In the case that adding the users would exceed the subscription limit, then none of the users in the user set are subscribed. Instead, all users in the user set are set to the Pending state and are listed in the Pending Users related list. Users that are currently subscribed are not affected. See Manage users in the Pending state on page 2916.

5. You can configure any subscription to check associated user sets for updates regularly and then update the list of subscribed users accordingly. On the Subscription form, select Auto-sync with user sets.

Note: If you do not select the Auto-sync with user sets option, then the user sets that you add to the subscription are never updated and the list of subscribed users does not auto-update over time.

6. On the Subscription form, click Update.

Auto-sync a subscription to user set updates
You can configure any subscription to check user sets regularly to find users who were added or removed. The system regularly subscribes or unsubscribes users based on updates to user sets.

Role required: usage_admin or admin
If the system cannot allocate a user because adding the user would exceed the subscription limit, the user is set to the Pending state and is listed in the Pending Users related list.

1. Navigate to Subscription Management Subscriptions.
2. Click the Name of the Per-User subscription to update.
3. On the Subscription form, select Auto-sync user sets.
4. On the Subscription form, click Sync Now to synchronize and update the list of subscribed users immediately.

Remove a user set from a subscription
When you remove a user set from a subscription, the system attempts to unsubscribe all users in the set. User sets are removed regardless of the Auto-sync with user sets setting.

Role required: usage_admin or admin
1. Navigate to Subscription Management Subscriptions.
2. Click the Name of the Per-User subscription.
3. In the User Sets list, select all user sets to remove.
4. In the Actions on selected rows list, select Remove From Subscription. On the Remove User Set from Subscription pop-up, click Remove.
   All users in the selected user sets are unsubscribed. If users in the user sets are pending, then the users are removed from the Pending Users list.

Delete a subscription user set
You can delete a subscription user set only if no subscriptions use the user set.

Role required: usage_admin or admin

**Note:** Deleting a user set is a permanent action — the user set will no longer exist. In contrast, you can remove a user set from a subscription to unsubscribe all users in the user set — the user set will still exist.

1. Ensure that the user set is not used by any subscription.
2. Navigate to Subscription Management Subscription User Sets and select the user set.
3. Click Delete.

Allocate an individual user from the Subscription form
In addition to adding user sets to a subscription, you can add individual users directly. Users that you allocate directly are subscribed immediately.

Role required: usage_admin or admin

**Note:** A user set, not individual allocation, is the preferred automated method for managing the pool of users who are subscribed to an application. Once you configure and allocate a user set, you do not need to manage individual users.

1. Navigate to Subscription Management Subscriptions.
2. Click the Name of the Per-User subscription to allocate users to.

3. Optional: On the Subscription form, to ensure that you do not exceed the purchased subscription limit, click Limit to purchased.

4. On the Subscribed Users related list, click Edit.

5. The form displays the list of users that you can add. Move the desired users from the Collection list into the Subscribed Users list and then click Save.

   The selected users are allocated to the subscription and the Allocated value is updated. If allocating a user would exceed the subscription limit, the user is not subscribed. Instead, the user is set to the Pending state and is listed in the Pending Users related list. See Manage users in the Pending state on page 2916.

6. Click Update on the Subscription form.

Allocate an individual user from the User Record form

To simplify the process of setting up user capabilities, you can allocate or deallocate an individual user to a subscription while viewing the user data on the User form. Users that you allocate directly are subscribed immediately.

Role required: usage_admin or admin

**Note:** A user set, not individual allocation, is the preferred automated method for managing the pool of users who are subscribed to an application. Once you configure and allocate a user set, you do not need to manage individual users.

1. Navigate to User Administration Users and then click the Name of the user. The User form opens.

2. On the Manage Subscriptions related list, click Edit.
3. The Edit Members slushbucket lists the subscriptions that you can allocate the user to. To allocate the user, move a subscription from the Collection list into the Manage Subscriptions list and then click Save.

The selected users are allocated to the subscription and the Allocated value is updated. If allocating a user would exceed the subscription limit, the user is not subscribed. Instead, the user is set to the Pending state and is listed in the Pending Users related list. See Manage users in the Pending state on page 2916.

To deallocate the user, move a subscription from the Manage Subscriptions list into the Collection list.

4. Click Update on the User form.

The Subscriptions related list is updated to list all subscriptions that the user is allocated to and the applications that the user is subscribed to.

Manage users in the Pending state

Users are set to the Pending state when adding the users would exceed the subscription limit (the Purchased value).

Role required: usage_admin or admin

Users are added to the Pending Users list when you attempt to allocate users in the following situations:

- User sets: If adding the user set exceeds the subscription limit, the user set is not added and all users in the set are set to the Pending state.
- Individual user: If allocating a user directly would exceed the subscription limit, the user is not subscribed and is instead set to the Pending state.

1. Navigate to Subscription Management Subscriptions.
2. Click the Name of the Per-User subscription.
3. In the Pending Users related list, select all users to update.
4. In the Actions on selected rows list, select an action.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allocate selected users</td>
<td>Allocates the users to the subscription and removes the user from the Pending Users list.</td>
</tr>
<tr>
<td></td>
<td>• If the Limit to purchased option is selected and adding the selected users would exceed the subscription limit (the Purchased value), then the action is not allowed.</td>
</tr>
<tr>
<td></td>
<td>• If the Limit to purchased option is not selected and adding the selected users would exceed the subscription limit (the Purchased value), then the system displays a pop-up to notify you.</td>
</tr>
<tr>
<td>Exclude from subscription</td>
<td>Excludes the user and removes the user from the Pending Users list.</td>
</tr>
<tr>
<td></td>
<td>Excluded users cannot be allocated to the selected subscription. The auto-sync process does not add excluded users.</td>
</tr>
<tr>
<td>Delete</td>
<td>Removes the selected users from the Pending Users list and performs no other action.</td>
</tr>
</tbody>
</table>
Unsubscribe a user

When you remove a user from a subscription, the user is unsubscribed.

Role required: usage_admin or admin

1. Navigate to Subscription Management Subscriptions.
2. Click the Name of the Per-User subscription.
3. In the Subscribed Users list, select all users to unsubscribe.
4. In the Actions on selected rows list, select Remove from subscription and then click Remove on the pop-up.

**Note:** If you unsubscribe a user who is a member of a user set that is associated with an auto-synced subscription, the user will be resubscribed in the next synchronization cycle. To remove such a user, exclude the user.

Exclude a user from a subscription

You can exclude users. Excluded users cannot be allocated to a specified subscription. The auto-sync process does not add excluded users.

Role required: usage_admin or admin

1. Navigate to Subscription Management Subscriptions.
2. Click the Name of the Per-User subscription.
3. In the Subscribed Users list, select all users to exclude.
4. In the Actions on selected rows list, select Exclude from subscription and then click Exclude on the pop-up.

Remove a user from the Excluded list

You can unexclude a user so that the user can be allocated to a subscription.

Role required: usage_admin or admin

1. Navigate to Subscription Management Subscriptions.
2. Click the Name of the Per-User subscription.
3. In the Excluded Users related list, select all users to unexclude.
4. In the Actions on selected rows list, select Delete and then click Delete on the pop-up.

The selected users are no longer excluded and are removed from the Excluded Users related list. No other action is taken.

**Note:** The users are not yet allocated to the subscription. You must manually add the users or synchronize the associated update set. On the Subscription form, click Sync Now to synchronize and update the list of subscribed users immediately.

Monitoring how subscriptions are allocated

You use the modules in the Subscription Management application to manage and monitor your purchased subscriptions throughout the subscription life-cycle. ServiceNow notifies usage admins by email when subscriptions are added or updated on your instance.
Subscription life cycle

1. Receive and view subscriptions
2. Allocate users to subscriptions
3. Monitor and adjust subscribed users
4. Plan for renewing subscriptions
5. Review the subscriptions that your organization has purchased

Subscription Management tasks

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
<th>Module to use to perform the task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receive and view subscriptions</td>
<td>Your instance downloads subscription information and notifies you by email. Now you can review the subscriptions to decide which actions to take.</td>
<td>Subscriptions module: View your subscription applications and allocation levels on page 2901</td>
</tr>
<tr>
<td>Task</td>
<td>Description</td>
<td>Module to use to perform the task</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Allocate users</td>
<td>You allocate fulfiller users to Per-User subscriptions. (The ServiceNow instance auto-allocates all other subscription types.) Allocation is typically a one-time task with minor maintenance.</td>
<td>Subscriptions module: <em>Allocating users to a Per-User subscription</em> on page 2909</td>
</tr>
</tbody>
</table>
| Monitor and adjust                       | You monitor usage of subscriptions: How many subscribed users, can you allocate more users, are there users who are not subscribed (out-of-policy users), and so on. As needed, reallocate users. | Subscription Overview module: *Monitor how resources are allocated to subscriptions* on page 2919  
Compliance Overview module: *Monitor subscription compliance* on page 2921                                                 |
| Plan for renewing subscriptions          | Review historical activity to prepare to renew subscriptions: How have usage patterns changed over time, is there high demand for a particular application, and so on.  
As needed, reallocate users.                                                                                              | Subscriptions module:  
• *View your subscription applications and allocation levels* on page 2901  
• *View Subscription Management history reports* on page 2907                                                             |
| Review the subscriptions that your organization has purchased | View the list of all types of subscriptions and check allocation levels at a glance.                                                                                                                      | Subscriptions module: *View your subscription applications and allocation levels* on page 2901                          |

**Monitor how resources are allocated to subscriptions**

Use the Subscription Overview module to monitor how users and resources are allocated to subscriptions.

Role required: usage_admin or admin

The system displays one chart for each subscription. You can:

- Monitor how resources (for example, discovered nodes or password reset requests) use Capacity subscriptions.
- Plan and budget for upcoming or future subscription needs.
- Assess whether you have allocated too many fulfiller users to a Per-User subscription. You might deallocate some users or purchase a subscription for more users.
- Assess whether you have allocated too few fulfiller users to a Per-User subscription. You might allocate more users.
- Determine whether users who are not subscribed are accessing a subscription application.

Navigate to Subscription Management Subscription Overview.

The Expired Subscriptions report lists all subscriptions where the service contract term has expired (the end date has passed). You should assess whether to renew any subscription that has expired.
Each Subscription Metrics chart displays the following data for a single subscription (at least one month of data is required):

- **Purchased**: The number of resources purchased for the subscription.
- **Allocated**: The average number of users for the month who have been allocated to the subscription.
- **Non-subscribed users**: The average number of individual users who performed fulfiller actions in the associated applications without being subscribed to the applications. Click a data point to view the application.

In the example, the organization updated the purchased subscription from 15 to 20 users in November 2015. Over the course of April 2016, the usage admin had allocated an average of about 19 users. In addition during the period, one user who was not subscribed performed fulfiller actions in an application associated with the subscription.
Monitor subscription compliance

Use the Compliance Overview module to monitor fulfiller actions by subscribed users and by users who are not subscribed to an application that your organization has purchased. In addition, a chart shows usage for applications where your organization has not yet purchased a subscription.

Role required: usage_admin or admin

Navigate to Subscription Management Compliance Overview to view the following charts:
• The Unique Application Users chart shows the number of individual subscribed users who performed fulfiller actions in the application. Each user is counted one time only, regardless of number of accesses.

• The Unique Out-of-Policy Users chart shows the number of individual users who performed fulfiller actions in the application without being subscribed to the application. Each user is counted one time only, regardless of number of accesses. This chart might alert you to users in the Pending state or users who are accessing the application without being subscribed.

• The Application Use Without a Purchased Subscription chart shows the number of users who performed fulfiller actions in an application even though your organization has not purchased a subscription for the application.

Configure the color codes for subscription allocation levels

On lists, forms, and charts, a configurable color code indicates the percentage of the subscription that has been allocated.

Role required: usage_admin or admin

In the example, the green color code for the Financial Management application and the yellow code for the Fulfiller application indicate that you can allocate additional users. The red code for Facilities Service Automation indicates that you have allocated more users than you have purchased a subscription for.

1. Navigate to Subscription Management Properties.
2. Update the Threshold for color codes [subscription.used.thresh] property setting and then click Save.

Specify a percentage value greater than 0 and less than 100. Default: 90% of the purchased subscription limit.

• Subscription allocation levels below the specified threshold are marked with a green color code.
• Allocation levels between the threshold and 100% are marked yellow.
Survey Management

With the ServiceNow® Survey Management application you can create, send, and collect responses for basic surveys. If installed, you can also use the Survey widget to set up a survey within Service Portal.

**Explore**
- Assessments and Surveys release notes
- Upgrade to London
- Get started with Survey Management on page 2439
- Key survey terms on page 2442
- Domain separation for Survey Management on page 2444

**Set up**
- Survey Management roles on page 2441

**Administer**
- Survey designer on page 2467
- Survey users and groups on page 2490
- Customize the appearance of a survey on page 2493
- Survey definitions on page 2495
- Survey trigger conditions on page 2521

**Use**
- View the results for a survey on page 2448
- View results for all surveys on page 2447
- Metric result fields on page 2448
- View a survey scorecard on page 2451
- Survey questionnaires on page 2442

**Develop**
- Developer training
- Developer documentation

**Migrate**
- Legacy survey migration on page 2532

**Troubleshoot and get help**
- Ask or answer questions in the IT Service Management community
- Search the HI Knowledge Base for known error articles
- Contact ServiceNow Support

Get started with Survey Management

Two versions of the application are supported, Survey Management, which is the latest version, and Legacy Surveys. Survey Management improves the user interface and extends the capabilities of the Legacy Surveys application.

**Note:** Survey Management does not support domain separation.
Configuring surveys

There are many options for advanced configuration in Survey Management:

- Create a survey, add questions, and choose recipients, all in one interface.
- Create conditional questions, which appear only when users answer other questions a certain way.
- Restrict a survey so only specific survey users can take it, and send invitations to those users simultaneously. Alternatively, make the survey a public survey so that any user can take the survey, even users who have not logged in to the ServiceNow system.
- Set a schedule to automatically assign a survey to users and to limit how often the same user can take a survey.
- Customize the look and feel of survey questionnaires.
- Save anonymous survey responses.
- Convert survey responses to numerical scores and view them on scorecards.
- Deactivate a survey for maintenance or to retire it without deleting it.

Note: Because surveys use the same tables and other back-end components as assessments, you may see assessment elements such as table and field names in certain places throughout the survey feature.

Legacy Surveys

Survey administrators can continue to use legacy survey functionality and data, however, it is recommended that you migrate legacy surveys to the Survey Management application. Concurrent use of both survey applications can cause confusion and redundancy.

Survey wizards are not impacted and cannot be migrated.

Note: The Legacy Surveys application is not described in the documentation that you are viewing. It is documented on the ServiceNow wiki.

Table 1168: Version comparison

<table>
<thead>
<tr>
<th>Capability</th>
<th>Surveys</th>
<th>Legacy Surveys</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surveys in Service Portal.</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Save new survey responses each time a user takes the same survey.</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Create question templates to reuse sets of answer options.</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Categorize survey questions and report on category results.</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Deactivate a survey without deleting it.</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Capability</td>
<td>Surveys</td>
<td>Legacy Surveys</td>
</tr>
<tr>
<td>------------</td>
<td>---------</td>
<td>----------------</td>
</tr>
<tr>
<td>Create conditional questions.</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Send surveys automatically based on a schedule.</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Customize survey questionnaire color scheme.</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Save anonymous survey responses for logged-in users.</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>View survey responses on graphical scorecards.</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Save surveys in a draft state until they are ready to publish.</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Create and send surveys from one page.</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Allow only specific users to access a survey.</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Send surveys based on conditions.</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Send survey email notifications.</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Limit how often a user can take the same survey.</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Add introduction and end note text.</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Create survey modules.</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Public survey: Allow persons to take a survey without logging in.</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Use update sets to track changes.</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

**Survey Management roles**

The Survey Management application uses the following roles.

No role is required to take assigned survey questionnaires.
Table 1169: Survey Management roles

<table>
<thead>
<tr>
<th>Role</th>
<th>Description</th>
<th>Contains roles</th>
</tr>
</thead>
</table>
| Survey administrator     | Create and administer surveys. Survey administrators know what types of surveys are necessary, when to send a survey, and to whom. Survey administrators can use all modules in the Survey application menu. | • survey_reader  
• assessment_admin |
| Survey reader            | View surveys and related information, such as survey responses, survey groups, scorecards, and reports. | none |

Key survey terms

These survey terms are used throughout the documentation to describe survey management functions and capabilities.

Table 1170: Key survey terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey definition</td>
<td>Root record on which a survey is built. A survey definition contains information such as the survey name, state, and distribution schedule. Each survey definition has its own categories and questions. Survey definitions are comparable to legacy survey masters.</td>
</tr>
<tr>
<td>Public survey</td>
<td>Any user can take a public survey, even users who have not logged in to the ServiceNow system. For a completed survey, the Assigned to field value is Guest.</td>
</tr>
<tr>
<td>Survey category</td>
<td>Represents a theme for survey questions. Categories contain one or more questions. The system creates one category per survey by default. Additional categories are optional.</td>
</tr>
<tr>
<td>Survey question</td>
<td>A question that appears on a survey questionnaire for the associated survey definition. Survey questions are comparable to legacy survey questions.</td>
</tr>
<tr>
<td>Survey user</td>
<td>User who is authorized to receive invitations for a restricted survey.</td>
</tr>
<tr>
<td>Term</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Survey instance</td>
<td>Represents one survey questionnaire assigned to one user. Survey instances are comparable to legacy survey instances.</td>
</tr>
<tr>
<td>Trigger condition</td>
<td>Defines a rule that enables the system to send a survey when an action occurs on a table, such as when an incident closes. Trigger conditions are comparable to legacy survey conditions.</td>
</tr>
<tr>
<td>Scorecard</td>
<td>Visual representation of survey responses. Scorecards display a variety of data summaries for one survey definition.</td>
</tr>
</tbody>
</table>

Survey questionnaires

All surveys that are assigned to you appear in your personal assessment and survey queue.

No special role is required to complete a survey but you must be logged in and the survey must be assigned to you. When you submit a survey, the system stores your responses.

Survey notification

If the system is configured to send email, it sends you a notification when a survey is assigned to you. The message contains a link to the survey and instructions for viewing the assessment and survey queue.

Take a survey

Surveys that are assigned to you, and that are not complete, appear in your assessment and survey queue.

Role required: none

Each assessment or survey appears as a card in the queue. The card contains helpful information, including the survey name, state, and due date, and a button to launch the questionnaire. Overdue surveys are clearly marked with a red icon and red due date. You must answer every mandatory question, indicated by a red asterisk, before you can submit the survey. If you start to take a survey but cannot complete it, save your responses and return to it later. When you have answered all the questions and are satisfied with the responses, submit the survey.

1. Navigate to Self-Service My Assessments & Surveys.
   Users with the assessment_admin role, including survey administrators, can display other users’ assessments and surveys in addition to their own. Use the Show all and Show assigned to me related links at the bottom of the queue to show and hide assessments and surveys. Click a card assigned to another user to open the associated metric type or survey definition.

2. Click Take Survey on a survey card to open the questionnaire.
   If there is more than one survey category, you can click the collapse or expand icon to hide or show the questions in the category.

3. Answer each question to the best of your ability.
   If you are unsure of how to respond to a question or if a question does not apply to a particular record, select Not Applicable, if available.
4. Complete one of the following steps.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Save your responses without submitting them</td>
<td>Click Save. You can close the questionnaire and access it later from your queue. <strong>Note:</strong> The system does not save the survey if there are invalid responses, such as a letter in a date field. You must enter valid responses or remove invalid responses before you can save the survey.</td>
</tr>
<tr>
<td>Submit the survey after answering all questions</td>
<td>Click Submit. You cannot return to the questionnaire after submitting. <strong>Note:</strong> If there is an unanswered mandatory question or an invalid response, an error message appears and the problematic questions are temporarily highlighted.</td>
</tr>
</tbody>
</table>

**Domain separation for Survey Management**

This is an overview of domain separation as it pertains to Survey Management. Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.

**Overview**

Support: Data only

Domain separation is supported in this application. Not all ServiceNow applications support domain separation; some include limitations on the data and administrative settings that can be domain separated. To learn more, see Application support for domain separation.

As a survey creator, survey_admin can create surveys in the assigned domain. A Global domain survey_admin can create or edit survey in any domain.

As a survey taker, a user can access the survey record and take the survey based on the domain of the survey record and user. Global domain users can take a survey in any domain.

**How domain separation works in Survey Management**

There are several main areas to consider in how domain separation works in Survey Management.

Survey Management in domain-separated instances

The following domains are available by default after activating the Domain Support-Domain Extensions Installer [com.glide.domain.msp_extensions.installer] plugin. Only ServiceNow employees can activate this plugin.

- Global
- Acme
Access to surveys in domain-separated instances

Based on the domain of the survey record and users, users can access the survey record and take the survey.

Global domain users can access survey records in any domain. Users in any other domain can access records in their domain and Global domain. For example, users in the Acme domain can access records in the Acme domain and the Global domain.

Global domain users can take a survey in any domain. Users in any other domain can take surveys in their domain as well as the Global domain. For example, users in Acme domain can take surveys in the Acme domain and the Global domain.

<table>
<thead>
<tr>
<th>Location of the survey record</th>
<th>Users who can access and take the survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>Global</td>
</tr>
<tr>
<td>Global</td>
<td>Yes</td>
</tr>
<tr>
<td>Acme</td>
<td>Yes</td>
</tr>
<tr>
<td>Cisco</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Any domain user can assign a survey in that domain to the same domain user or a Global domain user. For example, an Acme domain user can assign a survey to a Global domain user or an Acme domain user. Users from other domains are not visible to the Acme domain user.

Although the Global domain user can view a survey from other domains, this user cannot assign the survey of one domain to a user from a different domain. For example, a Global domain user can assign a survey from the Acme domain to another Global domain user or an Acme domain user, but not to a Cisco domain user.

Note: When a task is closed in a child domain and the assigned survey is either in the child domain or the global domain, the user from the child domain can then take the survey.

Trigger conditions in domain-separated instances

A Global domain user can create a triggered condition for a survey from any domain. The Global domain user can create an incident and trigger the survey by selecting a user from the other domain in the User field under Caller. However, the Global user cannot assign the survey to the user of different domain.

A user can assign a trigger condition to a survey if the user belongs to the Global domain or the Survey domain.

If there is no domain path for a trigger condition, users from any domain can view the trigger condition. For example, in the asmt_condition table that has no column for the domain path, users from the Acme domain can view the trigger condition created by the Cisco domain users.

Survey responses and results

There is a metric result record for each user response to each question on every survey instance. Survey results for each question and category are calculated automatically based on the metric result records.

If you use survey result calculations for results and scorecards, ensure that the positive indicator field for the question is set appropriately, based on the answer options. To have any results, a category must contain scored questions.
Survey responses

Survey responses are stored in the Metric Result [asmt_metric_result] table and display the recipients’ answers to each question in a category. To view general results, navigate to Survey Survey Responses. To view results for a particular criterion, use a filter on the Metric Result [asmt_metric_result] table. For example, to view results based on the assignment group, apply a filter condition for assignment group.

![Survey metric results](image)

Figure 634: Survey metric results
Category results

Category results are stored in the Assessment Category Result [asmt_category_result] table and display the overall ratings for each category based on the weighted value for each scored question. To view these results, navigate to Assessments Results Category results and filter the results using the [Type.Evaluation method] [is] [Survey] condition.

![Survey filter]

Figure 635: Assessment category results

Survey scorecards

A scorecard provides a visual breakdown of survey responses, based on the way questions were answered, by category. To access a scorecard, see View a survey scorecard on page 2451.
View results for all surveys

You can view the survey responses that are stored on the Metric Result [asmt_metric_result] table.

Role required: survey_admin or survey_reader

1. Navigate to Survey Survey Responses.
   Do not confuse this module with Survey Legacy Surveys Survey Responses, which displays legacy survey responses.
   The Type column displays the survey definition each response is associated with.
2. Select a response to view its details.

View the results for a survey

You can view the responses for one survey definition. Survey results are stored on the Metric Result [asmt_metric_result] table.

Role required: survey_admin or survey_reader

1. Navigate to Survey View Surveys
2. Open a survey definition.
3. Under Related Links, click View Responses, which is available only if there are results.
   The results are grouped by metric, which is what questions are called in assessments.
4. Open a metric result to view more detail.
   The metric result contains the user's response and calculated values of interest to advanced survey administrators. Because the Metric Result table is also used by the assessment feature, many field names are not clear in the context of surveys.
## Metric result fields

List of field descriptions for the Metric Result form.

### Table 1171: Metric Result form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment group</td>
<td>Assessment group to which the metric result belongs. An assessment group is a container for survey instances and results generated in a single occurrence. The system generates an assessment group every time at least one survey instance is created. If multiple survey instances are created at once, such as when a survey administrator sends invitations to a list of survey users, they are all stored in the same assessment group.</td>
</tr>
<tr>
<td>Metric</td>
<td>Question that the user answered.</td>
</tr>
<tr>
<td>Data type</td>
<td>Data type of the question the user answered.</td>
</tr>
<tr>
<td>Method</td>
<td>Assessment method. Always Assessment for surveys.</td>
</tr>
<tr>
<td>Updated</td>
<td>Date and time the metric result was last updated.</td>
</tr>
<tr>
<td>Source</td>
<td>Survey definition from which the associated survey instance was generated.</td>
</tr>
<tr>
<td>Assigned to</td>
<td>User who completed the survey questionnaire.</td>
</tr>
<tr>
<td>Instance</td>
<td>Survey instance completed by the Assigned to user.</td>
</tr>
<tr>
<td>Actual value</td>
<td>Value obtained from the user response to the question. The actual value is determined by the question data type:</td>
</tr>
<tr>
<td></td>
<td>• Checkbox: The actual value is 0 if the checkbox is cleared and 1 if it is selected.</td>
</tr>
<tr>
<td></td>
<td>• Choice or Likert Scale: The actual value is equal to the Value of the metric definition associated with the chosen answer option.</td>
</tr>
<tr>
<td></td>
<td>• Date, Date/Time, or String: The actual value is -1 to indicate that these data types do not contribute to category result calculations.</td>
</tr>
<tr>
<td></td>
<td>• Template: The actual value is equal to the Value of the template definition associated with the chosen answer option.</td>
</tr>
<tr>
<td></td>
<td>• Yes/No: The actual value is 0 if the response is No and 1 if it is Yes.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Normalized value</td>
<td>Adjusted value that accounts for the Scale definition setting, minimum and maximum values, and other factors. The equation that generates the value and an example calculation appear in Example: calculate the normalized value for a survey metric on page 2450.</td>
</tr>
<tr>
<td>String value</td>
<td>Value that displays the response as it appears on a questionnaire. In some cases this is the same as the Actual value, such as when the question data type is Percentage. The string value is N/A for unanswered questions of certain data types.</td>
</tr>
</tbody>
</table>

**Example: calculate the normalized value for a survey metric**

The normalized value is calculated based on a linear equation and the scale definition of the metric.

**Equation used to calculate the normalized value**

Normalized value = (Input Value - Min value defined in metric) / (Max value defined in metric - Min value defined in metric) * current metric weight / (sum of valid metric weight) * scale_factor

**Note:** The normalized values are directly proportional to the scale definition of the metric. If the scale definition is low, that is, the lower scale values are better, then Normalized value = 1.0 – Normalized value.

**Example**

Calculate the normalized value for the Please rate the competency of the technician metric. The metric has the following values:

<table>
<thead>
<tr>
<th>Table 1172: Values of the metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input value</td>
</tr>
<tr>
<td>Minimum value</td>
</tr>
<tr>
<td>Maximum value</td>
</tr>
<tr>
<td>Current metric weight</td>
</tr>
<tr>
<td>Number of responses</td>
</tr>
<tr>
<td>• 4 of type=number</td>
</tr>
<tr>
<td>• 1 of type=yes/no</td>
</tr>
<tr>
<td>• 1 of type=string (invalid data type; value cannot be calculated)</td>
</tr>
<tr>
<td>Valid metric weight of each response</td>
</tr>
</tbody>
</table>
Normalized value = \( \frac{3 - 1}{(6 - 1) * 10}{\frac{10 + 10 + 10 + 10 + 10}{10}} \) = 0.8

Several data types are ignored because the values cannot be calculated. These invalid data types include string, date, and datetime.

For reporting purposes, use the Metric Result [asmt_metric_result] table.

### View a survey scorecard

A survey scorecard provides a visual breakdown of survey responses by category, based on the way questions were answered.

Role required: survey_admin or survey_reader

A scorecard displays charts for survey results, in which category and question responses are analyzed and current ratings are compared with previous ratings. Users can examine ratings over time, compare question ratings, or compare the ratings of all categories. All ratings are averages for the time range selected. The system dynamically updates a scorecard each time you view it, so the ratings reflect recently completed surveys.

1. Navigate to Survey View Surveys.
2. Open a survey definition.
3. Under Related Links, click View Scorecard. The interactive scorecard displays the following filters:
   - **Question Results**: Displays the result of all questions or an individual question.
   - **Category Results**: Displays the results of all questions associated with an individual category or all categories.
   - **Average Ratings**: Displays the result of weighted average rating for each survey question in an individual category or all categories.
   - **History**: Displays the result of all questions in comparison with their history (by calendar year or quarters).
   - **Sentiment Analysis Results**: Displays the results of sentiment analysis for the survey.

   **Note**: The scorecard link is hidden if there are no survey results to report.

### Survey scorecard category results

The Category Results view is a stacked bar chart showing survey results for all questions in an individual category or all categories by respondent count.

Select a category from the list to display the questions from that category in the chart.

This view displays responses that use the following data types:

- Checkbox
- Choice
- Likert Scale
- Number
- Template
- Yes/No
- Multiple selection
- Image Scale
- Numeric Scale
Note: The Checkbox and Yes/No data types are combined into the Boolean data type in the Survey Designer

Figure 636: Survey category results

To view details about a specific response, point to the colored bar to display the response, the number of responses, and the percentage it represents of all the responses to that question.
Survey scorecard question results

The Question Results filter displays the result of all questions or an individual question using charts or lists. For the String, Attachment, Date, Date/time, Reference, and Ranking data types, the results are displayed in the list view. The results of all other data types are displayed in the pie chart view.

Pie chart

The pie chart shows question results for all data types other than those that are displayed in the list view. See Survey question data types on page 2480.

- Checkbox.
- Boolean.
- Choice.
- Likert Scale.
- Number.
- Percentage.
- Yes/No.
- Image Scale.
- Multiple Selection.
- Template. The question result shows the aggregated net promoter score (NPS) with promoters, detractors, and passives.

Table 1173: Net promoter score categories

<table>
<thead>
<tr>
<th>Question score</th>
<th>NPS category</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 or 10</td>
<td>Promoter</td>
</tr>
<tr>
<td>7 or 8</td>
<td>Passive or Neutral</td>
</tr>
<tr>
<td>0 to 6</td>
<td>Detractor</td>
</tr>
</tbody>
</table>

The result is calculated as:

- %Promoters = Number of promoters / Sample size
- %Detractors = Number of detractors / Sample size
- %Passives = Number of passives / Sample size
- NPS = %Promoters - %Detractors

Note: The Checkbox and Yes/No data types are combined into the Boolean data type in the survey designer.
Service Desk Satisfaction Survey

Survey Scorecard

How courteous and respectful was the technician who responded? (1=poor, 6=excellent)

2 = 2 (14.29%)  3 = 2 (14.29%)  4 = 9 (54.29%)  5 = 1 (7.14%)
Survey scorecard average ratings

The Average Ratings view displays the weighted average rating for each survey question in an individual category or all categories.

Use this view to learn how individual questions affect the overall rating for the category. Select a survey category from the choice list to display the chart for that category.
Service Desk Satisfaction Survey

Survey Scorecard

Average question rating in category: Service Desk Satisfaction Survey

How courteous and...
How satisfied are...
How satisfied w...
Please rate the t...
Was technician ab...

Average Normalized value
To view the effect of each question's ratings on the entire category's ratings, point to the colored bar. The pop-up box shows the percentage of the total ratings represented by each individual question's weighted average.

![Average ratings detail](image)

**Figure 640: Average ratings detail**

**Survey scorecard history**

The History view compares the current ratings for the categories and their questions with ratings from the previous three years or four quarters.

Ratings that have declined are highlighted in red and display negative numbers. Ratings that have improved are highlighted in green with positive numbers. Arrow icons beside the values in the Diff column indicate the trend of the current survey against the previous survey.

Point to a category to display a line chart that shows the rating trend for that category. Click a category to view the Survey Category form containing the survey questions.
To calculate the current ratings, the system averages the ratings from the trailing twelve month (TTM) period. The Diff column shows the discrepancy between the current ratings and the previous calendar year’s ratings.
### Service Desk Satisfaction Survey

#### Survey Scorecard

**Overall Rating**

<table>
<thead>
<tr>
<th></th>
<th>Current</th>
<th>Diff</th>
<th>2013</th>
<th>2012</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Service Desk Satisfaction Survey</strong></td>
<td>5.40</td>
<td>0.00</td>
<td>5.40</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>How satisfied were you with the response time to your incident? (1=not at all, 6=completely)</td>
<td>0.00</td>
<td>-1.02</td>
<td>1.02</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>How courteous and respectful was the technician who responded? (1=poor, 6=excellent)</td>
<td>0.00</td>
<td>-1.21</td>
<td>1.21</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Please rate the technical competency of the technician serving you (1=poor, 6=excellent)</td>
<td>0.00</td>
<td>-1.02</td>
<td>1.02</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Was technician able to resolve your issue during the first call?</td>
<td>0.00</td>
<td>-1.00</td>
<td>1.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>How satisfied are you with your overall service experience? (1=not at all, 6=completely)</td>
<td>0.00</td>
<td>-1.14</td>
<td>1.14</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

**Figure 642: Survey scorecard history - 3 years**
4 quarters

Quarterly surveys compare the average rating for each question and category in the current quarter against the average ratings from the previous four quarters. The Diff column shows the discrepancy between the current ratings and the previous quarter's ratings. The column labels count backward, by quarter from the current quarter. For example, if the current quarter is the 3rd quarter of 2015, then the previous quarters appear as 2nd [2015], 1st [2015], 4th [2014], and 3rd [2014]. All four of the previous quarters appear, whether or not there was any data for those quarters.
Figure 643: Survey scorecard history - 4 quarters
Export a survey scorecard as an image

You can export a scorecard as an image to use in presentations or other documents.

Role required: admin or survey_admin

1. Click the menu icon (≡) and select Save as PNG or Save as JPEG and wait for the export to complete.

2. Click Download and save the scorecard image to a storage location.
Survey administration

Survey administrators—users with the survey_admin role—create and maintain surveys and configure how they are distributed and published. Surveys on Service Portal are also supported.

Survey administration includes the following procedures.

• Create, customize, and publish surveys.
• Write and maintain survey questions.
• Define trigger conditions for when surveys are sent to users, such as when an incident closes.
• Maintain surveys and survey questions as the organization's needs change.

To set up surveys in Service Portal, you must first install Service Portal and then configure the Survey widget on the page. The base system includes the Survey widget.

Surveys in Service Portal

If Service Portal is installed, you can use the Survey widget to set up surveys, quizzes, assessments, risk assessments, and attestations in Service Portal. Surveys for users on mobile devices are fully supported in Service Portal.

To create an intuitive interface for your users, you can set up surveys in Service Portal on page 2610. You must first install Service Portal and then configure the survey widget on the page. To learn more about configuring a widget, see configure widget instances.
To configure a Survey widget on a page, CTRL + right-click the widget heading and select Instance Options.

**Table 1174: Service Portal: Instance options (properties) for the Survey widget**

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max records</td>
<td>Number of surveys to list on the Service Portal homepage. The user can click the View all link to view all items. Default: 5</td>
</tr>
<tr>
<td>Title of the widget</td>
<td>Text that appears in the title bar of the surveys widget. Default: My Surveys</td>
</tr>
</tbody>
</table>
Each survey on the My Surveys page contains a progress bar and a description. The color in the progress bar increases as a survey is completed. In the case of a triggered record, the table title is used for the survey description.

For mobile users, the Pagination setting for Service Portal view survey designer property is set to one question per page by default.
**One Click survey**

A One Click survey has no introduction page in Service Portal. This survey does not have the Submit and Cancel buttons in the desktop and iPad view.

**Note:**
- The One Click Survey field should be selected in the survey definition.
- If the public access is enabled for a One Click survey, a user can submit the survey without having to log in.

A kiosk survey is a One Click survey with only one question of any of the following types:
- Image Scale
- Choice
- Likert Scale
- Numeric Scale
- Yes/No

When you click the answer of the kiosk survey question in Service Portal, the survey is submitted and the end note is displayed on the same page as that of the survey questions.

**Note:**
- A kiosk survey does not have any Submit or Cancel buttons.
- A kiosk survey cannot have a signature, dependent questions, or additional information.

**URI parameters for One Click survey**

Pass these URI parameters through the createAssessment() API to store their values in the asmt_assessment_instance table for both platform view and Service Portal view.

**Table 1175: URI parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sysparm_refresh_interval</td>
<td>Refresh time (in seconds) after the survey submission to create another instance. For example, sysparm_refresh_interval=5.</td>
</tr>
<tr>
<td>sysparm_trigger_table</td>
<td>Location that is stored as the Trigger Table field in the asmt_assessment_instance table. For example, sysparm_trigger_table=incident.</td>
</tr>
<tr>
<td>sysparm_trigger_id</td>
<td>Location sysId that is stored as the Trigger ID field in the asmt_assessment_instance table. For example, sysparm_trigger_id=1c741bd70b2322007518478d83673af3.</td>
</tr>
<tr>
<td>Parameter</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>sysparm_kiosk</td>
<td>When set to true, both sysparm_trigger_table and sysparm_trigger_id parameters should be specified. This is a mandatory parameter for kiosk requests. For example, sysparm_kiosk=true.</td>
</tr>
</tbody>
</table>

View the overview of all surveys

Use this homepage to view various survey reports such as results by metric type and state. You can refresh, add, delete, and rearrange widgets. All reports on the Survey Overview page have demo data.

Role required: admin or survey_admin

1. Navigate to Survey Overview.
   The following reports are available:

   Table 1176:

<table>
<thead>
<tr>
<th>Report</th>
<th>Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surveys by Metric Type and State</td>
<td>Assessment Instance [asmt_assessment_instance]</td>
</tr>
<tr>
<td>Assignment group Customer Satisfaction 90 day average</td>
<td>Metric Result [asmt_metric_result]</td>
</tr>
<tr>
<td>Service Desk Survey 'Overall Experience' 60 Days</td>
<td>Metric Result [asmt_metric_result]</td>
</tr>
<tr>
<td>Service Desk Survey 'Timely Response' 90 Days</td>
<td>Metric Result [asmt_metric_result]</td>
</tr>
<tr>
<td>Service Desk Survey 'First Call Resolve' 60 Days</td>
<td>Metric Result [asmt_metric_result]</td>
</tr>
<tr>
<td>Service Desk Survey 'Tech Courteous' 90 Days</td>
<td>Metric Result [asmt_metric_result]</td>
</tr>
<tr>
<td>Service Desk Survey 'Tech Competence' 60 Days</td>
<td>Metric Result [asmt_metric_result]</td>
</tr>
</tbody>
</table>

2. Click elements within the reports to view the required information.
3. To refresh, edit, or close a widget, point to the widget and select the required option.

Survey designer

Users with the survey_admin role can use the survey designer. The survey designer lets you create survey categories and questions, configure the details, and publish the survey to specific users or groups.

You can assign a survey to individual users or groups who receive all the questions from all the categories. You can also customize each question and make it dependent on the response to another question. The following describes the procedures you follow to create and publish a survey.

- Create survey categories.
- Create questions within each category.
• Configure survey details, such as introductory and closing remarks and time limit.
• Select recipients for the survey.
• Publish the survey to the selected users or groups.

**Note:** The survey designer replaces the survey creator in the Legacy Surveys application. If you are using Internet Explorer version 8 or earlier, the system redirects you to the survey creator.

**Survey designer elements**

The survey designer is accessible from Survey Survey Designer.

The survey designer contains controls, a header bar, and the design canvas.

**Controls**

To create a question, drag the appropriate data type control from the Controls palette and drop it onto the designer canvas.
Figure 644: Controls
The assessment engine provides a built-in result calculation feature that converts responses to scored question data types to a score from 0 through 10.

**Table 1177: Question data types**

<table>
<thead>
<tr>
<th>Data type</th>
<th>Scored</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attachment</td>
<td>No</td>
<td>Question with a Manage Attachments icon that allows users to attach one or more files.</td>
</tr>
<tr>
<td>Boolean</td>
<td>Yes</td>
<td>Question with a check box or Yes and No choices for user responses.</td>
</tr>
<tr>
<td>Choice</td>
<td>Yes</td>
<td>List of predefined options. For more information, see the definition of the Choices field in Create a question in the survey designer on page 2475.</td>
</tr>
<tr>
<td>Date</td>
<td>No</td>
<td>Date field.</td>
</tr>
<tr>
<td>Date/Time</td>
<td>No</td>
<td>Date and time field.</td>
</tr>
<tr>
<td>Number</td>
<td>No</td>
<td>Number field with predefined minimum and maximum values. The default is 1-10.</td>
</tr>
<tr>
<td>Percentage</td>
<td>No</td>
<td>Percentage field with a prescribed range.</td>
</tr>
<tr>
<td>Scale</td>
<td>Yes</td>
<td>Predefined Likert scale. Answer options appear as radio buttons.</td>
</tr>
<tr>
<td>Numeric Scale</td>
<td>Yes</td>
<td>Selectable number scale. The default is 1-5. Answer options appear as radio buttons.</td>
</tr>
<tr>
<td>String</td>
<td>No</td>
<td>Single or multi-line text field.</td>
</tr>
<tr>
<td>Template</td>
<td>Yes</td>
<td>Choice list of templates that provide a predefined scale of options. For details, see Quiz scorecards on page 2378.</td>
</tr>
<tr>
<td>Reference</td>
<td>No</td>
<td>Choice list of fields from a specified reference table. This data type does not support reference qualifiers. For example, a user could select a user name if you specify sys_user as the reference table.</td>
</tr>
<tr>
<td>Data type</td>
<td>Scored</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>--------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Image Scale</td>
<td>Yes</td>
<td>Question with a choice of images that can be selected. A template can be used to apply the same images to multiple questions.</td>
</tr>
<tr>
<td>Multiple Selection</td>
<td>Yes</td>
<td>Question with multiple check boxes that can be selected.</td>
</tr>
<tr>
<td>Ranking</td>
<td></td>
<td>Question with an order number to be selected for each option. One order number cannot be selected twice. This question can be mandatory and it can also be dependent on a parent question, but not vice versa.</td>
</tr>
</tbody>
</table>

**Header bar**

The tabs on the header bar display views and a menu of functions. Click a tab to change the view on the canvas:

- Design: Add and configure the properties of categories and questions. This is the default view.
- Configuration: Create introductions and end notes for surveys and select a signature.
- Availability: Select the recipients for each category in the survey.

Point to the menu icon ( ) to select an option. The list of options depends on the currently open survey.

- Save: Save the current survey without changing its state.
- Preview: Display a preview of the survey as it appears to recipients.
- Publish: Distribute the survey to the selected recipients.
- Save and Publish: Save the survey to the Draft state and distribute the survey in one step.
- New Survey: Open a fresh canvas for a new survey.
- Load Survey: View the list of existing surveys.
- Copy Survey: Copy the current survey.

**Design canvas**

New surveys open in the canvas of the Design view. The survey Name field appears above first category in the canvas. A blank question field appears in the category container.
Configure a survey in the survey designer

Configuration settings apply to the entire survey.

Role required: admin or survey_admin

Select Configuration in the survey designer and complete the Survey Designer Configuration form:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>Select the check box to enable the distribution of this survey to recipients.</td>
</tr>
<tr>
<td>Anonymize responses</td>
<td>Select the check box to collect survey responses anonymously. Recipients are not listed with survey results. When a user submits a survey, the system clears the Assigned to field for the associated survey instance. Also, survey responses for anonymous surveys do not contain Assigned to values.</td>
</tr>
<tr>
<td>Note: The Assigned to field is cleared. However, each response record includes the Created By and Updated By fields that are accessible to users with the survey_admin role.</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Description of this configuration or the survey to which it is attached.</td>
</tr>
<tr>
<td>Introduction</td>
<td>Introductory content to display on surveys. You can add a welcome message or background information about the survey.</td>
</tr>
<tr>
<td>Signature</td>
<td>Acknowledgement by a survey recipient of requirements, admonitions, or expectations related to a survey.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Return URL</td>
<td>Destination address of a web page that is presented to users after they submit a completed survey. When a return URL is configured, the End note content does not appear.</td>
</tr>
<tr>
<td>End note</td>
<td>Content that is displayed to recipients after they submit a completed survey. You can add a thank you message, follow-up instructions, or other applicable information. End notes are not displayed if a Return URL is specified.</td>
</tr>
<tr>
<td>Public Survey</td>
<td>Enables public access to the survey. No login is required to take a public survey and users or non-users can respond anonymously. For completed public surveys, the Assigned to field value is Guest.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This check box is available only after you save the survey.</td>
</tr>
<tr>
<td>Survey Publish URL</td>
<td>Specifies a URL of the survey that can be shared with users.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This field is available only after you publish the survey.</td>
</tr>
<tr>
<td>Pagination setting for Service Portal view</td>
<td>Specify how the user will see pages on the desktop or tablet view in Service Portal.</td>
</tr>
<tr>
<td></td>
<td>• Category: Display each category on a separate page.</td>
</tr>
<tr>
<td></td>
<td>• Question: Display each question on a separate page. This happens for mobile regardless of this setting.</td>
</tr>
<tr>
<td></td>
<td>• None: All items on a single page—no pagination</td>
</tr>
<tr>
<td></td>
<td><strong>Default:</strong> Category</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This field appears only when Service Portal is installed.</td>
</tr>
<tr>
<td>One Click Survey</td>
<td>Enables a One Click survey in Service Portal.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This option can be selected if the Pagination setting for Service Portal view is set to None.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Source Table</td>
<td>Table whose field is used as a dynamic value for a question in a triggered survey.</td>
</tr>
<tr>
<td></td>
<td><em>Note:</em> When you select a source table, ensure that its relevant field is selected as Source Field value of a metric.</td>
</tr>
<tr>
<td>Allow Sentiment Analysis</td>
<td>Enables sentiment analysis for this survey.</td>
</tr>
<tr>
<td>Duration</td>
<td>Amount of time that recipients are given to complete this survey, starting from the time that the survey is generated. The default duration is 14 days.</td>
</tr>
<tr>
<td></td>
<td><em>Note:</em> By default, the system runs the Cancel Expired Assessments script every 30 days to cancel expired survey, assessment, and quiz instances that are in the Work in progress or Ready to take states.</td>
</tr>
</tbody>
</table>

**Survey categories**

Survey categories provide a way to group questions of a similar theme for a given survey.

There must be at least one survey category per survey definition and every survey question must be associated with a category. When you create a survey, the system generates one category, which all the questions belong to.

For simple surveys, one category is usually enough. Consider creating additional categories if you want to accomplish any of the following tasks.

- Separate groups of questions into collapsible sections by category on the survey questionnaire.
- Report on category scores, which are calculated based on responses for all questions within each category.

*Create a category in the survey designer*

A category represents a theme for evaluating a specific element of the survey topic and contains questions pertaining to that theme.

Role required: admin or survey_admin

When you create a survey, the system creates a default category, using the name of the survey. You can use this category, modify it, and create additional categories as needed. To have any results, a category must contain scored questions.

1. Navigate to Survey Survey Designer.
2. Enter the name of the survey in the Name field.
   - The system uses this name as the name of the survey and of the first category.
3. To configure the category, click the gear icon in its title bar and complete the following steps in the Properties dialog box.
   a) Enter a new name and a description for the category.
   b) Enter text in the Details field that introduces or explains the category to recipients.
c) Click the X icon to close the Properties dialog box and save your settings.

4. To add a new category, click the + icon in the title bar of an existing category. The new category appears below the category that you selected to create it. You can click the X icon in a category header to delete a category that you added in error.

Create a survey category in a survey
You can modify an existing survey to add one or more survey categories.

Role required: admin or survey_admin

Only one category is required for each survey, but you can add additional categories as needed.

1. Navigate to Survey View Surveys.
2. Open a survey definition.
3. In the Metric Categories related list, open a category or click New.
   Each survey category is stored as a record on the Metric Category [asmt_metric_category] table with a modified view for survey use.
4. Enter the survey category name and description.
   The category name appears on questionnaires when either of the following is true.
   • There is more than one category for the survey.
   • There is only one category and its name is different from the survey definition name. If you create a survey using the survey creator, the category name is the same as the survey definition name.
5. Right-click the form header and click Save.
   The Assessment Metrics and Users related lists appear.
6. Click Update.

Create a question in the survey designer
You can create multiple questions for each category in the survey designer, but each question can only be associated with one category.

Role required: admin or survey_admin

The data type that you select for each question determines how it can be answered by survey recipients.

1. In the Design view, drag a data type icon from the Controls palette and drop it into a category container.
2. To configure the question, click the gear icon in its title bar.
   The Properties dialog box opens.
3. Complete the form.

Table 1178: Question property fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Concise name of the question. The system uses this value to identify the question in Assessment Metric lists and in scorecard charts.</td>
</tr>
<tr>
<td>Question</td>
<td>Text to display as the question on surveys. Enter a clear, straightforward question that is easy to understand.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Type</td>
<td>Data type selected for this question. See the table in <em>Controls</em> for the available data types.</td>
</tr>
<tr>
<td>Active</td>
<td>Check box that determines whether this question is available on a survey. A question does not appear on surveys that are generated after the question becomes inactive.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Check box to require users to answer the question. Mandatory questions are denoted by a red field status indicator and must be answered before the survey can be submitted. This field is available when the question does not have a dependency and the question type is not Boolean with a check box option.</td>
</tr>
</tbody>
</table>
| Allow Additional Information | If selected, the Additional Information Label field is enabled. The Additional Information Label field value is displayed as a field on the survey response page to provide additional information for a question.  
  
  **Note:** This is not applicable for the String and Template data types. |
| Boolean option             | Whether a check box or a Yes/No list appears as the option for a Boolean question.                                                        |
| String option              | Setting for the appearance of a string field in a question. This field is available when the question type is String. The string options include the following.  
  • Single line: Single-line text field 40 characters in length that allows strings of any length.  
  • String line wide: Full page width text field that allows a single-line entry of any length.  
  • Multiline: Full page width multiline text field that allows word wrap and returns |
<p>| Min                        | Lowest positive whole number that users can enter or select to answer the question. This field is available when the question type is Number, Percentage, or Numeric Scale. |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max</td>
<td>Highest positive whole number that users can enter or select to answer the question. This field is available when the question type is Number, Percentage, or Numeric Scale.</td>
</tr>
<tr>
<td>Allow not applicable</td>
<td>Check box for including Not Applicable as an option for this question. Users can select Not Applicable if they do not have sufficient information to respond to a question. User responses of Not Applicable are excluded from results calculations. This field is available when the question does not have a dependency and the question type is not Boolean with a check box option.</td>
</tr>
<tr>
<td>Randomize answers</td>
<td>Check box for displaying answer options in a random order. Answer preference is sometimes influenced by the order in which options appear, which can result in biased results. Randomizing options can help prevent this bias.</td>
</tr>
<tr>
<td>Note: Randomizing options for certain questions may make those questions confusing for users. In general, only randomize options that do not follow a logical order.</td>
<td></td>
</tr>
<tr>
<td>Positive indicator</td>
<td>Setting that determines whether smaller or larger numerical values equate to a good score in result calculations. Select Low values if smaller numerical values are better, such as for a question that measures the number of incidents for a vendor. Select High values if larger numerical values are better, such as for a question that measures user satisfaction on a scale of one to five.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Source Field</td>
<td>Source table field that appears as a dynamic value for the question in a triggered survey. When this field value is selected, a <code>${param}</code> placeholder is added at the end of the question label.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> You can move this placeholder anywhere in the question label.</td>
</tr>
<tr>
<td></td>
<td>When a user takes the survey, the question with dynamic value is included in the survey instance and <code>${param}</code> placeholder is replaced with the source field value.</td>
</tr>
<tr>
<td></td>
<td>If the record table specified in the trigger condition does not match the source table specified for the survey, or if the system fails to get the dynamic value from the source record, the <code>${param}</code> placeholder is not replaced by any value and is displayed as is in the question.</td>
</tr>
<tr>
<td></td>
<td>For example, if the survey is triggered from a PRB record and the survey question is configured with a dynamic value from Incident, the <code>${param}</code> placeholder in the survey question label is not replaced by any dynamic value and is displayed as is.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> When survey questions are translated to other languages by a survey admin, the <code>${param}</code> placeholder should not be translated.</td>
</tr>
<tr>
<td>Allow Sentiment Analysis</td>
<td>Includes this question for the sentiment analysis of a survey.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This field is available only for String type questions.</td>
</tr>
<tr>
<td>Details</td>
<td>Information about the question that is displayed on the survey. Include details that help users understand how to answer the question.</td>
</tr>
</tbody>
</table>
### Field: Choices

**Description:** Options for a question with a data type of Choice or Scale. The system automatically adds text and values that you can edit for each option. You must have at least two options, and each option must have a unique value.

Click the + icon to add an option, or click the X icon to delete an option. By default, the system arranges options in the order established by their values. To change the order, drag and drop the options.

**Note:** Value numbers also contribute to the calculations of survey response scores, which can be used by advanced survey administrators.

---

**4.** To create any special conditions that must be met before the question appears on the survey, click the Dependency tab.

The question must have a data type of Boolean, Choice, Scale, or Template.

**5.** Select a question in the Displayed when field.

The system selects the appropriate operator and displays the possible answers for the selected question.

**6.** Select the answer that satisfies the condition.

You can select more than one answer. Selected answers are indicated by a check mark.

The system prevents recursive dependencies between questions. For example, if Question A depends on Question B, Question B cannot depend on Question A.

**7.** Click the X icon to close the question properties dialog box and save your settings.

**8.** To add a question with the same data type as an existing question in the category, click the + icon in the title bar of the existing question.

**9.** Drag and drop questions to change their order within a category or move them between categories.

**10.** To delete a question, click the X icon in its title bar.
Survey question data types

You must choose a data type for each survey question. The data type determines the format of the question and the kind of data that is collected on survey questionnaires.

The following data types are available for surveys:

**Attachment data type**

On questionnaires, users can attach one or more files to a question.

Users click the Manage Attachments icon and select one or more files in the Attachments pop-up window to attach to the question. From this window, users can:

- View a list of the attached files.
- View an attached file in a separate window.
- Rename an attached file.
- Add or delete files

Once a survey has been submitted, attachments cannot be updated or deleted.

Any type of file supported by the platform can be attached to a question. One or more files can be attached a question while taking a survey or completing an assessment.

The assessment administrator can see the attachments associated with an individual question as well as those associated with the survey.

See *Administering Attachments* for more information.

**Boolean data type**

On questionnaires, users select a check box beside a statement or leave it cleared.

If you select Boolean, you must fill in the Scale definition field. Select High if it is best when users select the check box.

**Choice data type**

On questionnaires, users select a value from a list of choices.
If you select Choice, you must fill in the Scale definition field and create answer options. Select High for the scale definition if the answer option with the largest metric definition Value is best.

**Note:** The system sets the Min and Max fields automatically based on the Value settings for the associated metric definitions.

**Date and Date/Time data types**

The Date and Date/Time data types are similar.

- **Date:** On questionnaires, users select a date.

- **Date/Time:** On questionnaires, users select a date and time.
Likert Scale data type

On questionnaires, users select a multiple choice value from a custom Likert scale. Each answer option is represented by a radio button on the scale. A Likert scale question that evaluates an application’s ease of use might have the answer options Easy, Average, and Difficult.

If you select Likert Scale, you must fill in the Scale definition field and create answer options. Select High for the scale definition if the answer option with the largest metric definition Value is best.

Note: The system sets the Min and Max fields automatically based on the Value settings for the associated metric definitions.

Number data type

On questionnaires, users enter a number.
If you select Number, you must fill in these additional fields:

- Scale definition: Select High if a larger number is better, such as for a question that measures the number of sales made in a quarter.
- Min and Max: Enter the smallest and largest numbers users can enter. State the range of acceptable answers in the question text.

**Percentage data type**

On questionnaires, users enter a number.

If you select Percentage, you must fill in these additional fields:

- Scale definition: Select High if a larger percentage is better, such as for a question that measures the percentage of work an agent has completed.
- Min and Max: Enter the smallest and largest numbers users can enter. Generally 0 and 100 are appropriate minimum and maximum values. If you choose values other than 0 and 100, it is usually best to state the range of acceptable answers in the question text.

**Reference data type**

On questionnaires, users select a value from a list that is generated from a specified reference table. The response field supports auto-completion.

**Note:** Reference qualifiers are not supported.

For example, a user could select a user name in response to a question if you specify User [sys_user] as the reference table.
String data type

On questionnaires, users enter text. When you select String, the String option field appears. Select one of the following options to determine how the string field appears on questionnaires:

- **Figure 646: Single line**

**Additional comments**

```
Template data type

On questionnaires, users select a value from a predefined series of answer options. To use this data type, a question template must be defined.

If you select Template, you must fill in these additional fields:

- Template: Select a template.
- Scale definition: Select High if the answer option with the largest template definition Value is best.

Yes/No data type

On questionnaires, users select Yes or No from a list.

If you select Yes/No, you must fill in the Scale definition field. Select High if Yes is the best answer.
**Image Scale data type**

On questionnaires, users select an image from a predefined set of images as their response. Image scale questions can also be used in a template for better performance with surveys that have the same type of answer options.

Five emojis, similar to the Likert scale (very dissatisfied to very satisfied) are provided. However, you can upload additional images in JPG, PNG, or GIF format. Two images can be uploaded, one for selected case and another for unselected case. Larger size images are reduced to 64 x 64 pixels.

The result behavior depends on the presence of uploaded images. If no selected image is uploaded, then the question shows up blank.

<table>
<thead>
<tr>
<th>Selected image</th>
<th>Unselected image</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Unselected image loads. Clicking on the image changes it to the selected image.</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
<td>Selected image loads with 50% opacity. Clicking on the image changes the opacity to 100%.</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>A blank placeholder box is displayed.</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>A blank placeholder box is displayed.</td>
</tr>
</tbody>
</table>

**Note:** N/A option is not supported for image scale type question.

**Multiple selection data type**

On questionnaires, users can select multiple check boxes indicating all answers that apply. For instance, a user can be instructed to “Select all that apply” in a multiple selection question.
Ranking data type

On questionnaires, users can select a different order number for each option to rank them. Drag-and-drop functionality is also supported, which allows a user to either fill in the number, or simply drag an option.

One order number cannot be selected twice. This question can be mandatory and it can also be dependent on a parent question, but not vice versa.

Edit a survey in the survey designer

You can modify surveys using the survey designer.

Role required: admin or survey_admin
You can edit a survey even after it has been distributed, with the following results.

- Added questions are available only on surveys that are distributed after this change.
- Changes to existing questions are immediately available to users before the survey is submitted or during the retake period. This includes changes to the answers, such as additional choices or changes to the data type.
- Deleted questions are also deleted from the distributed surveys in user queues.

**Note:** You can only edit a survey that has the same application scope as that of your current session.

1. Navigate to Survey Survey Designer.
2. Point to the menu icon in the survey header bar, and select Load Survey.
3. Select a survey from the list and modify it as needed.

**Configure category weights for a survey**

You can assign a weight to each category in a survey. The system calculates results from the weight that you configure.

Configure the Survey Category form to display the Weight field.

Role required: admin or survey_admin

Weights are set to a value of 10 by default but can be changed.

1. Navigate to Survey View Surveys and select a survey from the list.
2. In the Survey Definition form, select a category from the Metric Categories related list.
3. Edit the default weight value.
4. Click Update.

**View a survey instance**

A survey instance represents one questionnaire assigned to one user. You view an instance to verify that survey instances were created, to check the state of a survey instance, or to reassign a survey instance.

Role required: admin or survey_admin

1. Navigate to Survey Survey Instances. The following sub-modules are available based on the state of the instances:
   - Ready to take: Displays survey instances that are ready to be taken by the user. By default, these instances are sorted in ascending order by the Number field.
   - In progress: Displays survey instances that are in progress. By default, these instances are sorted in ascending order by the Number field.
   - Completed: Displays survey instances that are complete. By default, these instances are sorted in descending order by the Taken on field.
   - Cancelled: Displays survey instances that are cancelled. By default, these instances are sorted in ascending order by the Number field.
   - All: Displays survey instances in all states. By default, these instances are sorted in ascending order by the Number field.
2. Open a survey instance from the required sub-module. By default, the following fields are displayed in the Survey Instance form for all sub-modules other than Completed.

**Note:**
- When you open an instance in the Completed sub-module, you are redirected to the User's Response page.
- Each survey instance is stored as a record on the Assessment Instance [asmt_assessment_instance] table with a modified view for survey use.

### Table 1179: Survey Instance form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Automatically generated record number.</td>
</tr>
<tr>
<td>Metric type</td>
<td>Survey definition this survey instance was created from. Survey definitions are stored on the Assessment Instance table, and the field label on that table is Metric type.</td>
</tr>
<tr>
<td>Due date</td>
<td>Date by which the survey instance should be completed. The system populates the due date based on the Assessment duration of the associated survey definition, which is set to 14 days by default. The survey due date is not enforced in the base system. If you want to enforce the due date, consider using a workflow or other mechanism to send survey recipients reminders when a survey is overdue.</td>
</tr>
<tr>
<td>State</td>
<td>State of the survey instance.</td>
</tr>
<tr>
<td>Assigned to</td>
<td>User this survey instance is assigned to. This field becomes read-only when the state is In progress, Complete, or Canceled.</td>
</tr>
<tr>
<td>Domain</td>
<td>Domain associated with the instance.</td>
</tr>
<tr>
<td>Expiration date</td>
<td>Date on which the assigned user can receive a new instance of the same survey definition. The system automatically populates the expiration date based on the Schedule period of the associated survey definition.</td>
</tr>
<tr>
<td>Related Link</td>
<td></td>
</tr>
<tr>
<td>View User's Response</td>
<td>Shows a read-only version of the survey responses completed by the user.</td>
</tr>
</tbody>
</table>

*Note:* By default, the system runs the Cancel Expired Assessments script every 30 days to cancel expired survey, assessment, and quiz instances that are in the Work in progress or Ready to take states.
## Retry Sentiment Analysis

Sends the survey instances for sentiment analysis.

**Note:** This link is available only if any sentiment analysis result is not available for this instance under Survey Question Sentiment Results

## Related List

### Assessment Instance Questions

All instance question records, which store user response values for each question on the survey questionnaire. The following columns are relevant to surveys:

- **Category:** Displays the survey categories the questions belong to.
- **Metric:** Displays the survey questions.

### Survey users and groups

Survey users and survey user groups help survey administrators control who can take a survey.

Survey administrators can restrict a survey so that only specified users can access it unless a survey administrator manually assigns the survey to a different user. Survey user groups provide a way to quickly designate multiple survey users.

### Administering survey users

The list of survey users for a survey is visible on the Survey Definition and Survey Category forms. You can add or remove users from the list of survey users at any point. Note that designating a survey user does not automatically generate a survey instance for that user unless both of the following conditions are true:

- The survey definition Schedule period is set to Daily, Weekly, Monthly, or Yearly. In this case the system assigns a new survey instance to each survey user at the beginning of each schedule period.
- The user has no instances of the survey that are incomplete or that have not yet reached their expiration date.

You can designate survey users from the Survey Designer, the Survey Definition form, or the Survey Category form.

**Note:** If there are trigger conditions for a survey, do not create survey users. Instead, use the Trigger Conditions form to assign users.

### Create a survey user group

Survey user groups are groups that have the Type field set to survey and that display only the information most relevant to surveys. You can assign survey groups or any user group to surveys.

Role required: admin, user_admin, or survey_admin
Though it is possible to designate members of any group as survey users, one reason to create a survey group is to view it conveniently in the survey User Groups module.

1. Navigate to Survey Administration User Groups.
2. Click New.
3. Complete the Group form.
4. Right-click the form header and click Save.
   The Group Members and Groups related lists appear.
5. To add group members, complete the following steps:
   a) In the Group Members related list, click Edit.
   b) Select users from the list on the left and add them to the Group Members List on the right.
   c) Click Save.

Select recipients for a survey in the Survey Designer

You can assign survey users while designing or modifying the survey.
Role required: admin or survey_admin
1. In the Survey Designer, click the Availability tab.
2. Under Accessible by:, select the Specific users option, then select users.
3. If desired, select the Survey groups only check box, then select survey user groups or other groups.
4. Click Save.

Designate a survey user

You can designate one survey user at a time from the Survey Definition form.
Role required: admin or survey_admin
1. Navigate to Survey View Surveys.
2. Open a survey definition.
   There must be at least one category.
3. In the Survey Users related list, click New.
4. Select a User.
5. Click Submit.
   The Survey Definition form reopens.
6. To remove survey users, in the Survey Users related list, select the check box beside the user, and then select Delete from the action list below the list.

Designate or remove multiple survey users at one time

Use the Survey Category form to designate or remove multiple survey users at one time.
Role required: admin or survey_admin
1. Open a survey definition.
2. In the Metric Categories related list, open a category.
   You can choose any category. The system applies survey user changes to all the survey's categories automatically.
3. In the Users related list, click Edit.
4. Use the slushbucket to add or remove survey users.
5. Click Save to return to the survey category. The changes are also reflected in the Survey Users related list on the survey definition.

Allow recipients to retake a survey

You can configure a survey to allow recipients to resubmit their answers as many times as they like, up to the survey's due date.

Configure the Survey Definition form to display the Allow retake field. For more information, see *Configuring the form layout*.

Role required: admin or survey_admin

Results are not calculated for the survey until the configured duration has elapsed. The card in the user's queue remains visible until the due date of the survey, and a button is displayed to allow retakes.

1. Navigate to Surveys View Surveys.
2. Select a survey from the list.
3. Select the Allow retake check box.
4. Click Update.

Copy a survey

Create a copy of a survey with at least one category. All associated questions (type), configurations, categories, metrics, domain separation rules, and role-based categories are copied. Assigned users, category users, instances, and trigger conditions are not copied.

Role required: survey_admin or admin

1. Navigate to Survey View Surveys.
2. Open a survey definition.
3. Perform any of the following steps:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>From Platform</td>
<td>In the title bar, click Copy.</td>
</tr>
<tr>
<td>From Platform</td>
<td>In the title bar, select Copy from the context menu.</td>
</tr>
<tr>
<td>From survey designer</td>
<td>1. In the title bar, click Survey Designer.</td>
</tr>
<tr>
<td></td>
<td>2. In the Survey Designer title bar, point to the menu icon (🍔) on the header bar and click Copy Survey</td>
</tr>
</tbody>
</table>

Publish a survey

You must publish a survey to enable people to receive and complete survey instances.

Role required: admin or survey_admin

The State field on the Survey Definition form indicates whether the survey is in the Draft or Published state.
**Note:** You cannot return a survey to the Draft state after it has been published. You do have the option to deactivate a survey by clearing the Active check box.

1. Navigate to Survey View Surveys and select a survey to publish.
2. Click Publish.
   When you publish a survey, the system generates survey instances for any associated survey users. You can assign the survey to other users manually.

**Publish a survey in the Survey Designer**

You must save changes to a survey before you can publish it to the specified recipients or groups.

Role required: admin or survey_admin

1. In the Survey Designer, point to the menu and select Load Survey.
2. Select a survey to publish.
3. To preview the survey as a user, point to the menu icon and click Preview.
4. When you are satisfied with the survey, click either Save and Publish or Publish to distribute it.
   When you publish a survey, the system sends email notifications to the recipients and to their managers. The system displays a link to the survey on a card in each recipient's My Assessments & Surveys portal.

**Customize the appearance of a survey**

Assessment and survey administrators can set properties to customize the color of various elements on the questionnaires.

Role required: admin or survey_admin

**Note:**

- For color properties, enter either an HTML color name or hexidecimal (hex) value. For hex values, the # character is required. Values are not case-sensitive.
- For example, all of the following formats are valid: LightGray, lightgray, #D3D3D3. A preview of the color appears next to the field.

Note that the customizations you make apply to all assessments and surveys.

1. Navigate to either of the following modules.
   - Assessments Admin Assessment Properties
   - Survey Administration Properties
2. On the properties page, edit the properties as needed.
   Refer to the screenshot below to see what parts of assessment questionnaires are controlled by the properties.
3. Click Save.
   You may need to clear the browser's cache to see updates.

Assessment and survey properties

You can configure a variety of properties to customize the appearance of assessment and survey questionnaires, require authentication for user signatures, open surveys in the service portal view from emails, and limit the number of items shown in a decision matrix field filter.

Table 1180: Assessment and survey properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Label</th>
<th>Description</th>
</tr>
</thead>
</table>
| sn_portal_surveys.sp_survey.email_redirection | Allow survey link from email to open in service portal view (applies only for surveys) | When Yes is selected, a survey accessed from a link in an email opens in the Service Portal.  
   **Note:** This property applies only to surveys.  
   • Default value: No |
| com.snc.assessment.signature.authentication   | Require authentication for user signature.      | When Yes is selected, this property requires credentials for a full name signature.  
   • Default value: Yes |
| css.assessment.question.header.background.color | Sets the background color of question headers on assessment and survey questionnaires.  
   • Default value: #767676 |
### Survey definitions

A survey definition is the root record upon which a survey is built.

The survey designer generates a survey definition automatically when you save or publish the survey. Survey administrators may want to modify the survey definition to configure additional options for the survey, or to publish the survey when it is ready for distribution.

Survey administrators and survey readers can also send survey invitations directly to users from the survey definition.

### Modify a survey definition

You can configure additional options for a survey definition.

**Role required:** admin or survey_admin

1. Navigate to **Survey View Surveys**.
   Each survey definition is stored as a record on the Assessment Metric Type [asmt_metric_type] table with a modified view for survey use.

2. Open a survey definition. The Response Trend chart with the weekly trend of the survey instance count, and the Survey Summary chart with the overall summary response based on instance states are displayed.

3. Modify the fields on the Survey Definition form, as appropriate.

**Note:** You can only edit a survey that has the same application scope as that of your current session.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the survey, which appears on the questionnaire.</td>
</tr>
<tr>
<td>Description</td>
<td>Helpful information about the survey.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Active</td>
<td>Check box to activate the survey definition. When the Active check box is cleared, new survey instances cannot be generated and users cannot complete existing survey instances. Use the Active check box to deactivate or activate a published survey.</td>
</tr>
</tbody>
</table>
| Anonymize responses   | Check box to ensure that all responses for this survey are stored without the submitting user names. When a user submits a survey, the system clears the Assigned to field for the associated survey instance. Also, survey responses for anonymous surveys do not contain Assigned to values.  
**Note:** The Assigned to field is cleared. However, each response record includes the Created By and Updated By fields that are accessible to users with the survey_admin role. |
<p>| Send notifications    | Check box to send a notification that the survey has been taken.                                                                                   |
| State                 | Status of the survey: Draft or Published.                                                                                                         |
| Allow retake          | Check box that allows users to modify their answers to a completed survey. Users can resubmit a survey as many times as they want until the due date. After that date, the system removes the survey from the user's My Assessments &amp; Surveys page. |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
</table>
| Scheduled job       | Scheduled job the system creates for this survey definition when the schedule period is a repeating interval. The system sets the scheduled job to run according to the selected schedule period. If you change the schedule period and save the survey definition:  
  • The system deletes the old scheduled job.  

If you selected a recurring schedule period:  
  • A new scheduled job is created.  

For example, if you change the schedule period from Daily to Weekly and save the record:  
  • The system deletes the daily scheduled job.  
  • Creates a weekly one set to run a week from the current date.  

This field is visible to administrators only if the schedule period is Daily, Weekly, Monthly, or Yearly. |
| Assessment duration | The length of time to complete assigned survey instances, starting from the time the survey instance is generated. The assessment duration sets the Due date for each survey instance. The default duration is 14 days. Configure the form to see this field.  

**Note:** By default, the system runs the Cancel Expired Assessments script every 30 days to cancel expired survey, assessment, and quiz instances that are in the Work in progress or Ready to take states. |
<p>| Send notifications  | Select the check box to send notifications for the survey when it is published. Configure the form to see the field. |
| Other Options       |                                                                                                                                          |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Metric</td>
<td>A metric of the current survey that you can include as an image in the email or invitation sent to a survey user. When the survey user clicks the image in the email or while previewing the HTML body, the entire survey is available to be taken. <strong>Note:</strong> You cannot edit or delete a metric that is selected in this field.</td>
</tr>
<tr>
<td>Signature</td>
<td>Acknowledgement by a survey recipient of requirements, admonitions, or policies related to the survey. The signature may require the recipient to select a check box or to type a full signature to verify having read these assertions. You can display assertions without requiring a signature. Select an existing signature from the list or click New to create a new one. The signature form contains these fields: • Name: Descriptive name for this signature. • Signature type: Type of signature required. The selections are Check box, Full name, or Assertion only. If Assertion only is selected, no signature is required to submit the survey. • Assertion: Text you want to display to recipients. By default, a property called Require authentication for user signature (com.snc.assessment.signature_authentication) requires users to authenticate when providing a full name signature.</td>
</tr>
<tr>
<td>Schedule period</td>
<td>Option that determines how often a user can take the same survey and whether the system generates survey instances on a schedule. <strong>Note:</strong> If you use a trigger condition for a survey, ensure the schedule period is set to No Limit. Trigger conditions use a different method to regulate how often users can receive survey instances.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Pagination setting for Service Portal view | The setting on which the pagination is based for desktop or tablet view in Service Portal.  
  • Category: default  
  • Question: 1 question per page  
    (automatic for mobile)  
  • None: no pagination  
  
    **Note:** This field is displayed only when Service Portal is installed. |
| One Click Survey                           | Enables a One Click survey in Service Portal.  
  
    **Note:** This option can be selected if the Pagination setting for Service Portal view is set to None. |
| Source Table                               | Table whose field is used as a dynamic value for a question in a triggered survey.  
  
    **Note:** When you select a source table, ensure that its relevant field is selected as Source Field value of a metric. |
| Allow Sentiment Analysis                   | Enables sentiment analysis for this survey.                                                                                                                                                               |
| Introduction & End Notes                  |                                                                                                                                                                                                          |
| Introduction                               | Introductory content to display on survey questionnaires. Consider adding a company logo, a welcome message, background information about the survey, or instructions. |
| End note                                   | End note that appears when someone submits a survey questionnaire. Consider adding a thank you message, follow-up instructions, or other applicable information.                                                   |
| Related Links                              |                                                                                                                                                                                                          |
| Enable Public Access                       | Link that enables/disables the survey as a public survey. No login is required to take a public survey (including a survey with a trigger condition) and users or non-users can respond anonymously. For completed public surveys, the Assigned to field value is Guest.  
  
    **Note:** You can use the View Survey URL related link to share the URL with users. |
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>View Responses</strong></td>
<td>Link that opens the list of responses for this survey. This related link is available only if there are results for the survey.</td>
</tr>
<tr>
<td><strong>View Scorecard</strong></td>
<td>Link that opens the scorecard for this survey. This related link is available only if there are results for the survey.</td>
</tr>
<tr>
<td><strong>View Survey URL</strong></td>
<td>Link that opens a dialog box that displays a URL for this survey. The URL is useful for sharing a public survey. This related link is available only if the Active check box is selected. The URL does not work until the survey definition is published.</td>
</tr>
<tr>
<td><strong>Show Benchmarks</strong></td>
<td>Opens the Benchmarks Dashboard that provides visibility into your key performance indicators (KPIs) and trends.</td>
</tr>
<tr>
<td><strong>Create Improvement Initiative</strong></td>
<td>Opens the Improvement Initiative window to create an improvement initiative record that helps in improving the performance of the survey.</td>
</tr>
</tbody>
</table>

**Note:**
- This related link is available only for survey_admin, assessment_admin and survey_reader with bm_viewer role.
- You must opt in to Benchmarks to view the dashboard. See Enable Benchmarks
- This is applicable only for a published survey.

**Note:**
- This related link is available only for the survey_admin and assessment_admin role. A survey_reader can only view the created improvement initiative records.
- You should activate the Continual Improvement Management plugin (com.sn_cim).
## Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retry Sentiment Analysis</td>
<td>Checks all survey instances of this survey that do not have sentiment analysis data and sends them for analysis.</td>
</tr>
</tbody>
</table>

### Related Lists

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trigger Condition</td>
<td>Displays all trigger conditions associated with the survey.</td>
</tr>
<tr>
<td>Survey Responses</td>
<td>Displays all responses associated with the survey.</td>
</tr>
<tr>
<td>Metric Categories</td>
<td>All survey categories for this survey.</td>
</tr>
<tr>
<td>Survey Users</td>
<td>All survey users who are authorized to take this survey. If no users are listed, any user can take this survey.</td>
</tr>
<tr>
<td>Assessment Instances</td>
<td>All survey instances for this survey. Configure the form to add this related list to see it.</td>
</tr>
</tbody>
</table>

**Note:** If you add a related list to the form, use list control to omit the New button. The system generates survey instances to produce functional surveys.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improvement Initiatives</td>
<td>Displays improvement initiatives associated with the survey.</td>
</tr>
</tbody>
</table>

**Note:** This related list is available only when there is at least one improvement initiative record.

4. Save the record.

### Schedule periods

The available schedule periods are Only Once, No Limit, Daily, Weekly, Monthly, and Yearly.

The default schedule period is No Limit. When you set the schedule period to anything except Only Once or No Limit, the system creates a corresponding scheduled job. The scheduled job performs the following actions:

- Ensures that a user can take one survey instance of the same survey per schedule period.
- Generates a new survey instance for each survey user at the beginning of the new schedule period, as long as the survey user does not have an incomplete instance of that survey. A survey instance is incomplete if the state is not Complete.

For example, if you set the schedule period to Monthly and someone attempts to send survey invitations twice in the same day, the system generates survey instances for the survey users the first time only. At the beginning of the next schedule period, the system generates another survey instance for each survey user who completed the previous one.
Schedule periods are enforced by the Expiration date field on the survey instance. As long as the survey instance expiration date has not passed, the assigned user cannot receive a new survey instance. When the system generates a survey instance and the schedule period is anything except No Limit, the Expiration date field is automatically set to the appropriate date. For example, if the schedule period is Weekly, the expiration date is a week after the survey instance is generated.

If you change the schedule period, the scheduled job updates automatically to the correct schedule. However, users who have survey instances for the survey cannot receive new survey instances until their existing survey instances expire, regardless of the new schedule period.

Consider the following example: Sal Pindell receives a survey instance when the schedule period is Weekly. The next day, a survey administrator changes the schedule period to No Limit. Sal cannot receive another survey instance until one of the following actions occurs.

- Seven days pass from the time Sal's survey instance was generated.
- A survey administrator deletes Sal's survey instance.

After one of these actions occurs, Sal can receive a new survey instance anytime, as long as he has no incomplete instances of the survey.

Note: If you use a trigger condition for a survey, ensure the schedule period is set to No Limit. Trigger conditions use a different method to regulate how often users can receive survey instances.

Create a survey designer template question

You can create a question that uses choice lists from a template.

Role required: admin or survey_admin

1. Navigate to Survey Survey Designer and load a survey or create a new survey.
2. Drag the Template data type icon into a category container.
3. Click the gear icon in the question title bar to open the template properties dialog box.
4. Select a predefined scale from the list.
Question entry fields appear for that template.

5. Enter one or more questions that are appropriate for the template.
6. Click the arrow to the right of a question to configure its properties. You must provide a name for each question.
7. Click the back arrow to return to the template properties dialog box.
8. Configure the properties for the remaining questions.
9. Click the X icon to close the template properties dialog box and save your settings.

Survey questions

Survey questions appear on survey questionnaires for the associated survey definition.

The survey creator generates questions and answer options automatically. However, it provides only the basic configuration options for questions, such as the question text and the data type. You may want to create additional questions or set advanced configuration options for the questions, including making a question appear conditionally or making a question mandatory. You can also use question templates to define reusable sets of answer options.

Survey questions are available from Survey Questions. The list displays information about each question, including the associated survey definition listed in the Type column, and the data type. Survey administrators can modify these questions.
Create or modify survey questions

You can create and administer survey questions.

Role required: admin or survey_admin

Changes to a survey, such as the addition of questions or the modification of question templates, do not apply immediately to the existing survey instances. However, the changes apply immediately to any new survey instances that are created after the changes are saved.

1. Navigate to Survey View Surveys.
2. Open a survey definition.
3. In the Metric Categories related list, open a category.
4. In the Assessment Metrics related list, open an existing question or click New.
   Each survey question is stored as a record on the Assessment Metric [asmt_metric] table with a modified view for survey use.
5. Complete the Survey Question form.
   The fields that appear depend on the selected Data type.

Table 1182: Survey Question form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the question. When you create a survey, the question name is the same as the text in the Question field.</td>
</tr>
<tr>
<td>Question</td>
<td>Text to use for the question, which appears on survey questionnaires.</td>
</tr>
<tr>
<td>Data type</td>
<td>Data type of the question. The fields for the response depend on the data type.</td>
</tr>
<tr>
<td>Template</td>
<td>Question template to use for the answer options.</td>
</tr>
</tbody>
</table>

**Note:** If another question depends on this question, you cannot change the data type.

**Note:** If another question depends on this question, you cannot change the template.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale definition</td>
<td>Setting that determines whether smaller or larger numerical values equate to a good score in result calculations. Select Low if smaller numerical values are better, such as for a question that measures the number of incidents for a vendor. Select High if larger numerical values are better, such as for a question that measures user satisfaction on a scale of one to five. This field is visible and required only when certain data types are selected.</td>
</tr>
<tr>
<td>Randomize answers</td>
<td>Check box that determines whether to present the answer options for this question in a random order each time a user opens the survey. Answer preference is sometimes influenced by the order in which answer options appear, which can result in biased results. Randomize answer options to help prevent this bias. This field is visible only if the data type is Choice or Likert Scale. Note: Randomizing answer options may make a question confusing. In general, only randomize answer options that do not follow a logical order.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Check box that makes the question mandatory (selected) or optional (cleared) on survey questionnaires. Users cannot submit questionnaires until they provide valid responses to all mandatory questions, which are denoted by a red field status indicator. This field is visible only when the Depends on field is empty and the data type is not Checkbox. Questions that depend on other questions and check box questions cannot be mandatory.</td>
</tr>
<tr>
<td>Allow not applicable</td>
<td>Check box that determines whether to include a Not Applicable answer option for this question on survey questionnaires. User responses of Not Applicable are excluded from results calculations. This field is visible only if the data type is Choice, Likert Scale, Template, or Yes/No.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Allow Additional Information | If selected, the Additional Information Label field is enabled. The Additional Information Label field value is displayed as a field on the survey response page to provide additional information for a question.  
**Note:** This is not applicable for the String and Template data types. |
| Depends on                   | Setting used to make this a conditional question, meaning that it only appears when users answer another question a certain way.  
To make a question depend on another question, select an existing question from the list, which displays Checkbox, Choice, Template, and Yes/No questions of the same category as this question. Then, use the Displayed when field to set the conditions that cause this question to appear on surveys.  
The system prevents the creation of recursive dependencies between questions. For example, if Question A depends on Question B, Question B cannot depend on Question A. |
<p>| Displayed when               | Answer options for the selected Depends on question which, when chosen on surveys, display this question. This field is visible and required only when the Depends on field is set. |
| Min                          | Smallest numerical value to be used as an answer option for this question. This field is visible and required only if the data type is Choice, Likert Scale, Number, or Percentage. |
| Max                          | Largest numerical value to be used as an answer option for this question. This field is visible and required only if the data type is Choice, Likert Scale, Number, or Percentage. |
| String option                | Selection that determines what kind of response text box appears for this question on survey questionnaires. This field is visible and required only if the data type is String. |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source Field</td>
<td>Source table field that appears as a dynamic value for the question in a triggered survey. When this field value is selected, a <code>${param}</code> placeholder is added at the end of the question label.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> You can move this placeholder anywhere in the question label.</td>
</tr>
<tr>
<td></td>
<td>When a user takes the survey, the question with dynamic value is included in the survey instance and <code>${param}</code> placeholder is replaced with the source field value.</td>
</tr>
<tr>
<td></td>
<td>If the record table specified in the trigger condition does not match the source table specified for the survey, or if the system fails to get the dynamic value from the source record, the <code>${param}</code> placeholder is not replaced by any value and is displayed as is in the question.</td>
</tr>
<tr>
<td></td>
<td>For example, if the survey is triggered from a PRB record and the survey question is configured with a dynamic value from Incident, the <code>${param}</code> placeholder in the survey question label is not replaced by any dynamic value and is displayed as is.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> When survey questions are translated to other languages by a survey admin, the <code>${param}</code> placeholder should not be translated.</td>
</tr>
<tr>
<td>Allow Sentiment Analysis</td>
<td>Includes this question for the sentiment analysis of a survey.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This field is available only for String type questions.</td>
</tr>
<tr>
<td>Related Lists</td>
<td></td>
</tr>
<tr>
<td>Assessment Metric Definitions</td>
<td>Answer options for this question. This related list is available only if the Data type is Choice or Likert Scale.</td>
</tr>
</tbody>
</table>

6. Save the record.

**Note:**
- Be sure to create answer options if you select the Choice or Likert Scale data type.
• You cannot delete a survey question (metric) with user responses. To delete a survey question with user responses, you should delete the responses, and then delete the survey question.

---

Survey question data types

You must choose a data type for each survey question. The data type determines the format of the question and the kind of data that is collected on survey questionnaires.

The following data types are available for surveys:

**Attachment data type**

On questionnaires, users can attach one or more files to a question.

Users click the Manage Attachments icon and select one or more files in the Attachments pop-up window to attach to the question. From this window, users can:

• View a list of the attached files.
• View an attached file in a separate window.
• Rename an attached file.
• Add or delete files

Once a survey has been submitted, attachments cannot be updated or deleted.

Any type of file supported by the platform can be attached to a question. One or more files can be attached a question while taking a survey or completing an assessment.

The assessment administrator can see the attachments associated with an individual question as well as those associated with the survey.

See *Administering Attachments* for more information.

**Boolean data type**

On questionnaires, users select a check box beside a statement or leave it cleared.

If you select Boolean, you must fill in the Scale definition field. Select High if it is best when users select the check box.

**Choice data type**

On questionnaires, users select a value from a list of choices.
If you select Choice, you must fill in the Scale definition field and create answer options. Select High for the scale definition if the answer option with the largest metric definition Value is best.

**Note:** The system sets the Min and Max fields automatically based on the Value settings for the associated metric definitions.

### Date and Date/Time data types

The Date and Date/Time data types are similar.

- **Date:** On questionnaires, users select a date.

- **Date/Time:** On questionnaires, users select a date and time.
Likert Scale data type

On questionnaires, users select a multiple choice value from a custom Likert scale. Each answer option is represented by a radio button on the scale. A Likert scale question that evaluates an application’s ease of use might have the answer options Easy, Average, and Difficult.

If you select Likert Scale, you must fill in the Scale definition field and create answer options. Select High for the scale definition if the answer option with the largest metric definition Value is best.

**Note**: The system sets the Min and Max fields automatically based on the Value settings for the associated metric definitions.

Number data type

On questionnaires, users enter a number.
If you select Number, you must fill in these additional fields:

- **Scale definition**: Select High if a larger number is better, such as for a question that measures the number of sales made in a quarter.
- **Min and Max**: Enter the smallest and largest numbers users can enter. State the range of acceptable answers in the question text.

**Percentage data type**

On questionnaires, users enter a number.

If you select Percentage, you must fill in these additional fields:

- **Scale definition**: Select High if a larger percentage is better, such as for a question that measures the percentage of work an agent has completed.
- **Min and Max**: Enter the smallest and largest numbers users can enter. Generally 0 and 100 are appropriate minimum and maximum values. If you choose values other than 0 and 100, it is usually best to state the range of acceptable answers in the question text.

**Reference data type**

On questionnaires, users select a value from a list that is generated from a specified reference table. The response field supports auto-completion.

**Note**: Reference qualifiers are not supported.

For example, a user could select a user name in response to a question if you specify User [sys_user] as the reference table.
String data type

On questionnaires, users enter text. When you select String, the String option field appears. Select one of the following options to determine how the string field appears on questionnaires:

- Figure 649: Single line
On questionnaires, users select a value from a predefined series of answer options. To use this data type, a question template must be defined.

If you select Template, you must fill in these additional fields:

- Template: Select a template.
- Scale definition: Select High if the answer option with the largest template definition Value is best.

**Yes/No data type**

On questionnaires, users select Yes or No from a list.

If you select Yes/No, you must fill in the Scale definition field. Select High if Yes is the best answer.
Image Scale data type

On questionnaires, users select an image from a predefined set of images as their response. Image scale questions can also be used in a template for better performance with surveys that have the same type of answer options.

Five emojis, similar to the Likert scale (very dissatisfied to very satisfied) are provided. However, you can upload additional images in JPG, PNG, or GIF format. Two images can be uploaded, one for selected case and another for unselected case. Larger size images are reduced to 64 x 64 pixels.

How satisfied are you with the service provided by IT?

<table>
<thead>
<tr>
<th>Selected image</th>
<th>Unselected image</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Unselected image loads. Clicking on the image changes it to the selected image.</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
<td>Selected image loads with 50% opacity. Clicking on the image changes the opacity to 100%.</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>A blank placeholder box is displayed.</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>A blank placeholder box is displayed.</td>
</tr>
</tbody>
</table>

Note: N/A option is not supported for image scale type question.

Multiple selection data type

On questionnaires, users can select multiple check boxes indicating all answers that apply. For instance, a user can be instructed to “Select all that apply” in a multiple selection question.
Equipment Usage Survey

Multiple Selection

What equipments do you use?

- Laptop
- Tablet
- Smart Phone

Ranking data type

On questionnaires, users can select a different order number for each option to rank them. Drag-and-drop functionality is also supported, which allows a user to either fill in the number, or simply drag an option.

1. Please rate following device in order of Importance.

One order number cannot be selected twice. This question can be mandatory and it can also be dependent on a parent question, but not vice versa.

Survey question template

Question templates define reusable sets of answer options for survey questions.
Question templates define reusable rating scales for answering questions, where each answer option on the scale is a template definition. For example, the template named Satisfaction represents a satisfaction scale and contains the following template definitions: Very Satisfied, Satisfied, Neutral, Dissatisfied, and Very Dissatisfied.

![Template definition]

**Figure 652: Template definition**

Templates are available for survey questions that have Data type set to Template. The following question templates are available in the base system. You can create or update a template as described in *Create a survey question template* on page 2518.

<table>
<thead>
<tr>
<th>Name</th>
<th>Template definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount</td>
<td>None, Few or little, Average amount, Many, Quite a lot</td>
</tr>
<tr>
<td>Complexity</td>
<td>Very Complex, Complex, Moderate, Simple, Very Simple</td>
</tr>
<tr>
<td>Frequency</td>
<td>Never, Seldom, Sometimes, Most of the time, All of the time</td>
</tr>
<tr>
<td>Likert 5</td>
<td>Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree</td>
</tr>
<tr>
<td>Quality</td>
<td>Very Poor, Poor, Average, Good, Very Good</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>Very Dissatisfied, Dissatisfied, Neutral, Satisfied, Very Satisfied</td>
</tr>
<tr>
<td>Size</td>
<td>Very Small, Small, Average, Large, Very Large</td>
</tr>
</tbody>
</table>

*Create a survey question template*

You can create and administer question templates.

**Role required: admin or survey_admin**

Changes to a survey, such as the modification of question templates, apply to existing survey instances immediately. Templates that you create are available for use with both surveys and assessments.

1. Navigate to Survey Templates.
   Each template is stored as a record on the Assessment Metric Template [asmt_template] table.
2. Click New.
3. Enter a Name.
4. Right-click the form header and click Save.
5. In the Assessment Template Definitions related list, click New.
Create a template definition for each answer option you want to appear on a question.

6. Complete the form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display</td>
<td>Enter the text to appear as the answer option.</td>
</tr>
<tr>
<td>Value</td>
<td>Enter a numeric value, greater than or equal to zero, to which the answer option equates. Values are used in results calculations. When you view questions that use templates, answer options appear in order from smallest to largest Value. Each template definition for a given template must have a unique Value.</td>
</tr>
</tbody>
</table>

7. Click Update.

*Update min and max values to match templates*

If you use survey result calculation data, ensure that the Min and Max values for a question that uses a template are equal to the smallest and largest template definition Value.

Role required: admin or survey_admin

When you create a question of the Template data type, the system sets the Min and Max fields based on the template definition values. The fields for existing questions are not updated if you add a new template definition to a template or if you update the Value of an existing template. If the new Value is less than the minimum value or greater than the maximum value of any questions that use the template, update the questions accordingly.

1. Navigate to Survey Questions.
2. Configure the list to show the Min and Max columns.
3. Add the following list filter condition: [Template] [is] [<select the template you updated>].
4. Ensure the Min and Max values match the smallest and largest template definition Value for the selected template.
   If the values do not match, edit the Min and Max values directly from the list.

**Note:** When the data type is Template, a UI policy prevents the editing of Min and Max from the form.

---

Create or modify answer options

You must create answer options, called metric definitions, for survey questions that have Data type set to Choice or Likert Scale.

Role required: admin or survey_admin

Changes to a survey, such as the addition or modification of answer options, apply to existing survey instances immediately.

1. Navigate to Survey Questions.
2. Open a choice or Likert scale survey question.
3. In the Assessment Metric Definitions related list, open a metric definition or click New.
   Each answer option is stored as a record on the Assessment Metric Definition [asmt_metric_definition] table.
4. Complete the Assessment Metric Definition form.

Table 1184: Assessment Metric Definition fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display</td>
<td>Text to appear as the answer option.</td>
</tr>
<tr>
<td>Value</td>
<td>Numeric value, greater than or equal to zero, to which the answer option equates. Values determine the order in which answer options appear. See the example below. Values are also used to calculate survey results. Each metric definition for a given question must have a different Value.</td>
</tr>
</tbody>
</table>

5. Click Submit.

On survey questionnaires, the answer options for a question appear in order from smallest to largest Value. For example, consider the survey question How do you feel? with the answer options Good, Neutral, and Bad. The following table shows the answer option order based on the Value.

Table 1185: Answer option order based on value

<table>
<thead>
<tr>
<th>Answer option</th>
<th>Value</th>
<th>Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>1</td>
<td>First</td>
</tr>
<tr>
<td>Neutral</td>
<td>3</td>
<td>Second</td>
</tr>
<tr>
<td>Bad</td>
<td>5</td>
<td>Third</td>
</tr>
</tbody>
</table>

If you use survey result calculations, ensure the question Scale definition is set appropriately based on the answer options. In the previous example, if you want the answer option Good to earn the highest score, the scale definition should be Low because Good has the smallest value.

Change the order of survey questions

You can easily reorder survey questions at the category level or the question level.

Role required: admin or survey_admin

You can change the order in which the questions in one category appear relative to those in other categories for the same survey definition. If you add a new question manually after you create other questions, you may want to change the order of questions.

When you create questions using the survey creator, the system sets the Order field for the first question to 101, the second to 102, and so on. After you create a new question outside of the survey creator, the Order is set to 100 by default, which means it appears before all questions generated by the survey creator.

1. Navigate to Survey View Surveys and open the appropriate survey definition.
2. In the Metric Categories related list, edit the values in the Order column.
3. To change the order of questions within a category, complete the following steps.
a) Open the Assessment Metrics related list.
b) Edit the values in the Order column.

4. Click Update.

Survey trigger conditions

Trigger conditions specify when to send a particular survey and the persons to send it to.

Survey administrators can use trigger conditions to configure the system to generate a survey instance each time a specified action occurs on a specified table, for example, when an incident or change request closes. The system sends the survey to users that are related to the triggering record, for example, incident callers or change request assignees. You can choose to send a survey every time the condition is met, or you can set a probability for the system to send a survey at random when the condition is met.

Trigger conditions are ideal for sending transactional surveys. Transactional surveys generally measure satisfaction with a recent experience, such as closing an incident or purchasing an item.

Note: Trigger conditions are comparable to survey conditions in legacy surveys. If you migrate a legacy survey that has survey conditions, ensure that the survey conditions are deactivated before you recreate them as trigger conditions.

Configure a trigger condition for a survey

You can configure trigger conditions to specify when to send a particular survey and the persons to send it to.

Role required: admin or survey_admin

1. Navigate to SurveyTrigger Conditions.
2. Click New.

Note: Do not specify particular users for a triggered survey because only the specified users are allowed to take the survey.

3. Complete the form.

Table 1186: Trigger condition fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment</td>
<td>Survey to send.</td>
</tr>
<tr>
<td>Table</td>
<td>Table to run the trigger condition on. You can select only tables in the current application scope. For example, to send a survey whenever an incident closes, select the Incident [incident] table.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| User field         | Field that stores the users you want to send the survey. You can select any field, on the selected table or on a referenced table, that references the User [sys_user] table. Use the tree picker to select a field.  

**Note:** To avoid requiring users to log in to take a survey with a trigger condition, set the survey to Public.                                                                                                                                                                                                 |
| Repeat interval    | Minimum period that must pass before the trigger condition can resend the survey to the same user. For example, assume the repeat interval is set to 30 days. Even if the same user qualifies for multiple surveys from this trigger condition, the system can send only one survey every 30 days.  

**Note:** Ensure that the Schedule period of the selected survey definition is set to No Limit. If the schedule period is set to a different value, it prevents the trigger condition from sending surveys as expected. |
<p>| Application        | [Admin only] Application is set to Global.                                                                                                                                                                                                                                                                                                                      |
| Active             | Check box that determines whether this trigger condition is active (selected).                                                                                                                                                                                                                                                                                 |
| Business rule      | [Admin only] Business rule the system creates to monitor the selected table. When the condition is met, the business rule sends the survey to the correct user. No configuration is necessary for this business rule.                                                                                                                                                                     |
| Trigger randomly   | Check box that determines whether to send the survey to the appropriate user every time the condition is met (cleared) or only a percentage of the time (selected).                                                                                                                                                                                                     |
| Probability (%)    | Approximate probability that the survey is sent each time the condition is met. For example, if the probability is set to 50, the system sends the survey approximately 50% of the time the conditions are met. There are no repeat interval restrictions is assumed. This field is visible and required only when Trigger randomly is selected. |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Related Field 1- 4</td>
<td>Field that contains a value you want to store for reporting purposes. You can pick any reference field on the selected table. When the trigger condition generates a survey instance, the system stores the value from the triggering record. Specify up to four fields. For example, select the Incident table, Assigned to and Problem as related fields. The system stores the assigned user and problem associated with the incident as Related record 1 and Related record 2 in the survey instance record. To view the fields, configure the form for any survey instance. <strong>Note:</strong> You cannot use a related field for the ticket number because you cannot select the Number column. You can, however, use the trigger_id column of the table.</td>
</tr>
<tr>
<td>Description</td>
<td>Summary information to identify the trigger condition. <strong>Note:</strong> For a triggered record, the table title is used for the survey description.</td>
</tr>
<tr>
<td>Condition</td>
<td>Condition builder that defines the criteria that must be true to send the survey. For example, to send a survey whenever an incident closes, create the condition [State] [is] [Closed].</td>
</tr>
</tbody>
</table>

You can also create a trigger condition directly from the survey creator. If you select Certain users can take this survey, based on conditions in the Survey User Access section, the Trigger Condition form opens automatically when you click Save as Draft or Publish.
<table>
<thead>
<tr>
<th>Trigger Condition</th>
<th>new record</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment</td>
<td>Service Desk Satisfaction Survey</td>
</tr>
<tr>
<td>Table</td>
<td>Incident (Incident)</td>
</tr>
<tr>
<td>User field</td>
<td>Click to select...</td>
</tr>
<tr>
<td>Repeat Interval</td>
<td>Days 30</td>
</tr>
<tr>
<td></td>
<td>Hours 00 00 00</td>
</tr>
<tr>
<td></td>
<td>Related Field 1: None</td>
</tr>
<tr>
<td></td>
<td>Related Field 2: None</td>
</tr>
<tr>
<td></td>
<td>Related Field 3: None</td>
</tr>
<tr>
<td></td>
<td>Related Field 4: None</td>
</tr>
<tr>
<td>Description</td>
<td>Send incident callers service desk satisfaction surveys when incidents are closed</td>
</tr>
<tr>
<td>Condition</td>
<td>Add Filter Condition    Add &quot;OR&quot; Clause</td>
</tr>
<tr>
<td></td>
<td>– choose field –   – operator –   – value –</td>
</tr>
</tbody>
</table>

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Trigger condition example

You can send out auto-triggered surveys when an incident is closed or resolved.

A trigger condition is configured as follows:

- Assessment: Service Desk Satisfaction Survey
- Table: Incident [incident]
- User field: Caller
- Repeat interval: 30 days
- Active: true
- Trigger randomly: false
- Related Field 1: Assigned to
- Related Field 2: Problem
- Condition: [State] [is] [Closed] [or] [State] [is] [Resolved]

Fannie Steese is the caller on incident INC00004305 that is assigned to Boris Catino, a service desk technician. Boris creates PRB010101 based on Fannie’s complaint and closes the incident. The system creates a survey instance assigned to Fannie so she can rate her satisfaction with the incident experience.

Because two related fields were selected as part of the trigger condition, the survey instance stores the following information from the incident:

- User (Related Field 1): Boris Catino
- Problem (Related Field 2): PRB010101
- Task (automatically created): INC00004305

Because the task field is automatically populated, UI-based filtering by dot-walking on incidents (or any task-based table) is supported when creating a report on survey results. For example, you can query all survey instances related to incidents assigned to a group (survey reports on all incidents assigned to networking group, for instance).

Note: Even though the trigger condition is set to be triggered each time that the conditions are met, the Repeat interval setting ensures that Fannie does not receive another survey for another of her incidents closes within 30 days of the first incident.

Survey report example based on task field

One of the most common use cases for Surveys is to send out an auto-triggered survey when an incident, request, or task is closed. Once you get the survey results back, you can filter the results by users and groups related to the ticket, such as Assignment Group, or Assignee.

Filtering the survey results provides more detail on how people and teams are performing based on ticket data. Since this information is automatically captured, you can dot-walk while filtering the data (instead of utilizing a related field on the Survey trigger condition form, as previously required).
To create a report on incident-triggered survey responses by Assignment group, set up the report on the Task Assessment Details by navigating to Reports View/Run and clicking Create a report.

Survey distribution

There are several ways for survey administrators to distribute surveys to users. Surveys are distributed using any of the following methods.

- Send survey invitations to users
- Share a survey URL that opens the survey directly.
- Create a module that opens a survey.

Send survey invitations to users

You can send survey invitations using the Assign Survey or Send Invitations buttons on the Survey Definition form.

Role required: admin or survey_admin

Use the Send Invitations button to immediately assign survey instances to each survey user that is listed in the survey definition. Use the Assign Survey button to assign a survey instance to any one user at a time.

Each of the buttons generates survey instances assigned to the appropriate users. In addition, if the instance is configured to send email, the system generates survey notifications. For either button to be available, the survey definition must meet all of the following conditions.

- Active check box is selected.
• State is Published.
• Survey is associated with at least one question.

Note: You (or a trigger) can send more than one instance of a survey to a user at any time.

1. Navigate to Survey View Surveys.
2. Select an active, published survey.
3. Complete one of the following actions.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assign a survey to users listed in the Survey Users related list</td>
<td>Click Send invitations.</td>
</tr>
<tr>
<td>Assign a survey to any user</td>
<td>Click Assign Survey and select one or more users, and then click OK.</td>
</tr>
</tbody>
</table>

The system creates a survey instance assigned to the user or users, assuming the user is eligible to receive a new survey instance. When you use the Assign Survey button, the selected user is not saved as a survey user.

Survey URLs

You can distribute a survey by giving survey users a survey URL.

Survey administrators can obtain one of the following types of URLs.

• A general URL for a survey, which users can open to take the survey questionnaire. The following process occurs.
  • When someone opens the URL, the system ensures that the person is logged in. It then searches for an instance of the associated survey that is assigned to the logged-in user.
  • If a survey instance is found, the appropriate action occurs based on the State of the survey instance (see table). If there are multiple active survey instances (Ready to take or In progress), the instance with the earliest due date opens.
  • If no survey instance is found, the system creates a new instance for the survey, assigns it to the user, and opens the survey questionnaire.

• A URL for a specific survey instance, which the assigned user can open to take the survey questionnaire. The following process occurs.
  • When someone opens the URL, the system ensures the person is logged in as the user the survey instance is assigned to. Only the assigned user can access the survey questionnaire.
  • The appropriate action occurs, depending on the State of the survey instance (see table).

<table>
<thead>
<tr>
<th>Survey instance state</th>
<th>Action upon opening URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ready to take: User has not saved any responses.</td>
<td>The survey questionnaire appears for the user to begin. The user can save or submit responses.</td>
</tr>
<tr>
<td>In progress: User has saved at least one response.</td>
<td>The survey questionnaire appears for the user to continue. Any previously saved responses are displayed. The user can save or submit responses.</td>
</tr>
</tbody>
</table>
If someone opens a URL for an unpublished or deactivated survey, an error message appears.

**Obtain and distribute a general survey URL**

You can distribute a general survey URL to allow any eligible user to open a survey questionnaire.

Role required: admin or survey_admin

The general URL is available on the Survey Definition form and on the survey creator. You can also email the URL for a public survey that is published.

1. Navigate to Survey View Surveys.
2. Open a survey definition from the Assessment Metric Types list.
3. To view or copy the URL, click the View Survey URL related link.
   This related link is visible only if the survey definition is Active.
4. To distribute the URL to users, paste the copied URL as desired, or click the Email button to send via email.
   The Email button is visible only for a public survey that is published.

When a survey user clicks the general survey URL, the system creates a survey instance for the survey user as long as the user does not have an instance in the Ready to take state. The system is configured by default to send an email notification when a survey instance is generated.

As a result, the survey user receives a second notification in addition to the notification that you sent with the general survey URL. This may confuse the survey user. To avoid this issue, you can deactivate auto-notification.

**Deactivate auto-notification for surveys**

When you send a survey notification with a general survey URL to a survey user, the user may receive a second system-generated notification. To avoid this issue, you can deactivate auto-notification.

Role required: admin or survey_admin

1. Navigate to System Notification Email Notifications.
2. Open the Survey User Invite notification.
3. Configure the form to add the Send to event creator check box to the Who will receive section.
   The Send to event creator check box is selected by default.
4. Clear the Send to event creator check box.
   The system will no longer send auto-notification messages to survey users.

**Obtain a survey instance URL**

You can distribute a survey instance URL to allow the assigned user to open a survey questionnaire.

Role required: admin or survey_admin
The survey instance URL is available on the survey instance record.

1. Navigate to Survey Survey Instances.
2. Open the instance for the survey.
3. To view or copy the URL, click View Instance URL related link.
   The related link is available only when the survey instance State is Ready to take or In progress and the associated survey definition is Active.
4. In the dialog box, select and copy the URL then click OK or Cancel.
5. Distribute the URL to the assigned user.

Test a survey URL
When there are survey users associated with a survey, the survey is restricted so only those users can use the survey URL. You can test the survey URL to ensure it is restricted.

Role required: admin or survey_admin
1. Navigate to Survey View Surveys and open a survey for which you are not a survey user.
2. Under Related Links, click View Survey URL.
3. Copy the URL and click OK or Cancel.
4. Navigate to the URL.
   You see a message that you are not authorized to take the survey.

Create a survey module
You can create a module that opens a survey.

Role required: admin or survey_admin

When a user clicks a survey module, the system performs one of the following actions, depending on the configuration options for the survey and other factors.

• Creates a new survey instance
• Opens an existing survey instance
• Displays an error message.

1. Perform the appropriate action for your version of the UI:
   • UI16: Point to the application menu that contains the module to which you want to add the survey module and click the edit application (pencil) icon.
   • UI15: Right-click the application menu you want to add the module to and select Edit Application Menu
2. In the Modules related list, click New.
3. Complete the following fields.
   • Link type: Assessment
     Do not select Survey, which is used for legacy surveys only.
     • Assessment: Select the survey you want the module to open.
4. Complete and save the form.

Sharing surveys: export and import
You can export a survey and then import it to a different ServiceNow instance.
The system exports a single XML file that contains a survey definition [asmt_metric_type] and the associated records, including the following.

- Assessment Metric Template [asmt_template]
- Assessment Template Definition [asmt_template_definition]
- Metric definitions [asmt_metric_definition] (survey question answer options)
- Scheduled Jobs associated with the Survey [sys_trigger]
- Survey categories [asmt_metric_category]
- Survey questions [asmt_metric]
- Survey users [asmt_m2m_category_user]
- Trigger Condition [asmt_condition]

Export a survey
You can export a survey and then import it to another instance.

Role required: admin, survey_reader, or survey_admin

For information about update sets, see System update sets.

1. Navigate to Survey View Surveys.
2. Right-click the name of a record to show the context menu.
3. Select Export Assessment.
4. If applicable, follow the prompt in your browser to save the XML file.

Import a survey
You can import a survey that has been exported as an XML file. The exported XML file does not contain result data.

Role required: admin or survey_admin

Note: Update sets are available in the Helsinki release and should be used to move data from one instance to another. For information about update sets, see System update sets.

1. Verify that the target instance has assessments enabled.
2. Follow the steps in Import an XML file to import the assessment.

Use update sets for surveys and assessments
Use an update set to capture changes to surveys and assessments.

Role required: admin or survey_admin

When developing surveys and assessments, you can use an update set to capture the changes and move them from a development instance to a production instance. Once an update set is created and marked current, all of the updates to the following tables are recorded in the update set.

The following tables are now update set enabled and also extend the application file:

- Assessment Metric Templates [asmt_template]
- Assessment Template Definitions [asmt_template_definition]
- Assessment Metric Definitions [asmt_metric_definition]: survey question answer options
- Schedule [sys_trigger]: scheduled jobs associated with the survey
- Assessment Metric Categories [asmt_metric_category]: survey categories
- Assessment Metrics [asmt_metric]: survey questions
- Assessment Category Users [asmt_m2m_category_user]: survey users
- Trigger Conditions [asmt_condition]

**Sentiment analysis for surveys**

You can use sentiment analysis to determine whether user responses for a survey are considered positive, negative, or neutral.

Activate the Sentiment Analysis (com.snc.sentiment_analysis) plugin.

For a survey, you can select questions that should be used for analysis. The survey responses of these questions are sent to the thirdparty platforms for analysis through the specified connector configurations.

**Note:** You can only use string type questions for sentiment analysis.

The sentiment analysis results are displayed under **Survey Question Sentiment Results**. The sentiment label is based on the normalized score:

<table>
<thead>
<tr>
<th>Normalized score</th>
<th>Sentiment label</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1 to 0</td>
<td>Negative</td>
</tr>
<tr>
<td>0</td>
<td>Neutral</td>
</tr>
<tr>
<td>0 to 1</td>
<td>Positive</td>
</tr>
</tbody>
</table>

**Configure a sentiment connector**

Specify the service URL and other configuration information for third party APIs that are used for sentiment analysis.

Role required: admin

1. Change the scope of the current session to Sentiment Analysis.
2. Navigate to **Sentiment Analysis Sentiment Connector Configurations**.
3. Add or edit the connector configuration for a third party vendor such as Google, IBMWatson, and MSAzure.

**Note:** By default, placeholders are available for configuring connectors for Google, IBMWatson, and MSAzure.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the sentiment analysis connector configuration.</td>
</tr>
<tr>
<td>Active</td>
<td>Check box to activate the connector configuration.</td>
</tr>
<tr>
<td>Credential Alias</td>
<td>Credential alias associated with the connector configuration. It has a reference to the system level table (sys_alias_list).</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Default</td>
<td>Check box to make this as the default connector configuration.</td>
</tr>
<tr>
<td>Description</td>
<td>Description of the connector configuration.</td>
</tr>
<tr>
<td>Script</td>
<td>Script to call the Sentiment Analysis API and the normalize the values.</td>
</tr>
</tbody>
</table>

4. Configure the connector credentials
   a) Open the record referred in the Credential Alias field.
   b) Under the Connections tab, select the connection.
   c) In the Connection URL field, enter the value.
   d) Open the record referred in the Credentials field.
   e) Enter the credential information.

   **Note:**
   - You should obtain the connection credentials from the respective third-party vendors.
   - If the credential is an API key, specify its value. If the credential is basic authentication, that is, user name and password, specify the corresponding information.

   f) Select the Active check box and click Update.

5. Select the Active check box for the connector configuration and click Update.

**Sentiment analysis properties**

You can use the sentiment analysis properties to customize the Sentiment Analysis module.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response time for the outbound call of Sentiment Analysis API (sn_nlp_sentiment.glide.sentiment.transaction.timeout)</td>
<td>Maximum time (milliseconds) expected for executing the outbound call for Sentiment Analysis API before it's timeout.</td>
</tr>
</tbody>
</table>

**Sentiment analysis results**

The sentiment analysis results view contains a bar chart that displays the percentage of positive, negative, and neutral results, along with the instance count for each category.

**Color indicators**

Following are the color indicators in the bar chart:

- Green: Positive
- Red: Negative
- Blue: Neutral
Legacy survey migration

Users with the survey_admin role can migrate legacy survey data to create copies of legacy surveys and their related records in assessment tables. The Survey Management application, which is built on the assessment engine, is available as an alternative to legacy surveys.

The following legacy survey components are migrated:

- Survey masters
- Supported survey questions and question choices
- Survey instances
- Survey responses

Legacy survey conditions are not migrated and must be recreated as trigger conditions.

**Note:**

- The Legacy Surveys and Legacy Administration modules are available on instances upgraded from a previous release but not available for new instances. Customers using legacy survey or survey wizard should plan to migrate to the Survey Management application to create modern and high quality surveys for their users.
- The following legacy survey plugins are inactive by default, and are available upon request:
  - Best Practice - Task Survey Management (ID: com.snc.bestpractice.task_survey)
  - Survey Management (ID: com.glideapp.survey)
  - Assessment Components (ID: com.snc.assessment)
  - Survey Wizard (ID: com.glideapp.survey_wizard)
- Survey wizards cannot be migrated.

Migrate a legacy survey

Migrate a legacy survey and its related records to take advantage of a more powerful feature set.

Role required: admin or survey_admin

To avoid timing out for very large surveys, you can disable the transaction quota. See *Transaction quotas*.

1. Navigate to SurveyLegacy SurveysMasters.
   The list of legacy survey masters appears. By default, the list shows only survey masters that have not been migrated. To show all survey masters, remove the Assessment is empty breadcrumb.

2. Open a survey and click the Migrate to New Survey Management related link or Migrate to New Survey Management in the title bar.
   A dialog box describes what happens when you migrate the survey. Note that certain types of survey questions cannot be migrated.

3. Click OK.
   The system generates records on assessment tables based on the survey master, eligible questions and choices, results, and other related survey components. The original survey components are unaffected.

   System messages may appear at the top of the Survey form to notify you of questions that could not be migrated and to advise you to review migrated Multiple Choice questions.

4. Click the reference icon beside the Assessment field to view the new survey definition.

5. Remove survey users from the assessment survey if you want all users to be able to take it.
When you migrate a survey, any users who have taken it are automatically associated with the assessment survey and become survey users. When there are survey users associated with an assessment survey, only those users can take it.

6. Deactivate any survey conditions associated with the survey by completing the following steps.
   a) Navigate to Survey Legacy Administration Survey Conditions.
   b) In the Active column, ensure the value is false for any survey conditions that reference the migrated survey.

7. Navigate to Survey Administration Trigger Conditions to create new trigger conditions for the migrated survey.

The Migrate to Assessment related link on the legacy survey record becomes unavailable after the migration. However, if you delete the record referenced in the Assessment field, the related link reappears and you can migrate the legacy survey again.

Survey question migration

Before you migrate a legacy survey, understand that some legacy survey questions cannot be migrated due to incompatible question types.

Legacy survey questions are migrated from the Survey Question [survey_question_new] table to the Assessment Metric [asmt_metric] table. In legacy surveys, the Type field on the Survey Question table determines how the question renders on the survey questionnaire. In assessment surveys, the Data type field on the Assessment Metric table serves a similar purpose. Certain legacy survey types are not supported in assessment surveys.

The following table shows the conversion path for each legacy survey question type to an assessment data type, if there is one.

**Table 1191: Survey question migration**

<table>
<thead>
<tr>
<th>Legacy survey type</th>
<th>Assessment data type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Break</td>
<td>Not available</td>
</tr>
<tr>
<td>CheckBox</td>
<td>Checkbox</td>
</tr>
<tr>
<td>Date</td>
<td>Date</td>
</tr>
<tr>
<td>Date/Time</td>
<td>Date/Time</td>
</tr>
<tr>
<td>HTML</td>
<td>Not available</td>
</tr>
<tr>
<td>Label</td>
<td>Not available</td>
</tr>
<tr>
<td>List Collector</td>
<td>Not available</td>
</tr>
<tr>
<td>Lookup Multiple Choice</td>
<td>Not available</td>
</tr>
<tr>
<td>Lookup Select Box</td>
<td>Not available</td>
</tr>
<tr>
<td>Macro</td>
<td>Not available</td>
</tr>
<tr>
<td>Macro with Label</td>
<td>Not available</td>
</tr>
<tr>
<td>Multi Line Text</td>
<td>String (String option set to Multiline)</td>
</tr>
<tr>
<td>Multiple Choice</td>
<td>Likert Scale</td>
</tr>
<tr>
<td>Numeric Scale</td>
<td>Number</td>
</tr>
<tr>
<td>Reference</td>
<td>Not available</td>
</tr>
<tr>
<td>Legacy survey type</td>
<td>Assessment data type</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-----------------------------------------------------------</td>
</tr>
<tr>
<td>Select Box</td>
<td>Choice</td>
</tr>
<tr>
<td>Single Line Text</td>
<td>String (String option set to Single line)</td>
</tr>
<tr>
<td>UI Page</td>
<td>Not available</td>
</tr>
<tr>
<td>Wide Single Line Text</td>
<td>String (String option set to Single line wide)</td>
</tr>
<tr>
<td>Yes / No</td>
<td>Yes/No</td>
</tr>
</tbody>
</table>

**Migrated components**

When you migrate a survey, the system maps records from survey tables to assessment tables. To create a functional survey on the assessment framework, the system converts survey records to the most logical equivalent assessment survey records. This may mean multiple assessment survey records represent one legacy survey record.

**Table 1192: Migrated components**

<table>
<thead>
<tr>
<th>Survey component</th>
<th>Assessment survey components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey master [survey_master]</td>
<td>• Survey definition [asmt_metric_type]</td>
</tr>
<tr>
<td></td>
<td>• Assessable record [asmt_assessable_record], for system use only</td>
</tr>
<tr>
<td></td>
<td>• Survey category [asmt_metric_category]</td>
</tr>
<tr>
<td>Survey question [survey_question_new]</td>
<td>• Survey question [asmt_metric]</td>
</tr>
<tr>
<td>Question choice [question_choice]</td>
<td>• Assessment metric definition [asmt_metric_definition]</td>
</tr>
<tr>
<td>Survey instance [survey_instance]</td>
<td>• Assessment group [asmt_assessment], for system use only</td>
</tr>
<tr>
<td></td>
<td>• Survey instance [asmt_assessment_instance]</td>
</tr>
<tr>
<td>Survey response [survey_response]</td>
<td>• Survey instance question [asmt_assessment_instance_question]</td>
</tr>
<tr>
<td></td>
<td>• Survey response [asmt_metric_result]</td>
</tr>
<tr>
<td></td>
<td>• Category result [asmt_category_result], for system use only</td>
</tr>
</tbody>
</table>

**Migrated question review**

To maintain accurate result calculations, you may need to make minor adjustments to some of the migrated survey records to ensure results are calculated correctly.

**Note:** The assessment engine provides a built-in result calculation feature that converts each survey response to a score between 0 and 10. The configuration required to maintain accurate...
For each legacy question migrated, the system creates a survey question record on the Assessment Metric [asmt_metric] table. For legacy questions of the Multiple Choice and Select Box types, the system also creates a metric definition record, on the Assessment Metric Definition [asmt_metric_definition] table, for each legacy question choice.

Table 1193: Comparable metric definitions and survey question choices

<table>
<thead>
<tr>
<th>Survey question choice field</th>
<th>Related metric definition field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text</td>
<td>Display</td>
</tr>
<tr>
<td>Value (can be any string value)</td>
<td>Value (must be a numerical value)</td>
</tr>
<tr>
<td>Order</td>
<td>Value (metric definition with smallest Value is first)</td>
</tr>
</tbody>
</table>

When the system migrates legacy survey question choices, it uses the legacy Order to set each metric definition Value. For the legacy question choice with the smallest Order, the corresponding metric definition Value is set to 1. For the legacy question choice with the next smallest Order, the metric definition Value is 2, and so on.

The Scale definition field on the migrated Survey Question form determines whether smaller or bigger metric definition values equate to a good score in survey result calculations. By default, the scale definition is set to High, meaning bigger values are good. When you migrate a legacy survey, check that the default scale definition makes sense for each question.

For example, the following tables depict a sample migrated question and the metric definitions automatically created for it. Recall that the system uses the order of the legacy survey question choices to set the metric definition value. Excellent has the lowest Order value, so when the system creates a metric definition for this question choice, the Value is set to 1. In this case the default scale definition value, High, does not make sense, as the system will calculate the worst scores for responses of Excellent.

Table 1194: Legacy question: Please rate the overall quality of your service.

<table>
<thead>
<tr>
<th>Question choice text</th>
<th>Question choice value</th>
<th>Question choice order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>A</td>
<td>100</td>
</tr>
<tr>
<td>Good</td>
<td>B</td>
<td>200</td>
</tr>
<tr>
<td>Fair</td>
<td>C</td>
<td>300</td>
</tr>
<tr>
<td>Poor</td>
<td>D</td>
<td>400</td>
</tr>
</tbody>
</table>

Table 1195: Migrated question: Please rate the overall quality of your service.

<table>
<thead>
<tr>
<th>Metric definition display</th>
<th>Metric definition value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>1</td>
</tr>
<tr>
<td>Good</td>
<td>2</td>
</tr>
<tr>
<td>Fair</td>
<td>3</td>
</tr>
<tr>
<td>Poor</td>
<td>4</td>
</tr>
</tbody>
</table>
If there are no Order values for the legacy survey question choices, the system sets each corresponding metric definition Value based on the alphanumerical order of the legacy Text value.

**Table 1196: Migrated question: Please rate the overall quality of your service.**

<table>
<thead>
<tr>
<th>Metric definition display</th>
<th>Metric definition value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>1</td>
</tr>
<tr>
<td>Good</td>
<td>2</td>
</tr>
<tr>
<td>Fair</td>
<td>3</td>
</tr>
<tr>
<td>Poor</td>
<td>4</td>
</tr>
</tbody>
</table>

You may also need to change the Scale definition setting for other migrated questions. For details, see the scale definition recommendations for each survey question data type.

**Task Communications Management**

Task Communications Management (TCM) provides a framework for defining and managing a communication process for any entity that extends the task table. Task Communications Management helps you to streamline the process by creating designated plans for effective communication during an event.

A communication plan defines:

- who should be informed
- what information needs to be shared and when that information should be delivered
- methods of communication

When you have a predefined communication plan, you can focus on resolving the current issue instead of deciding when to send a communication, what information to share, and who to inform.
How Task Communications Management works

With Task Communications Management, you can predefine a communication plan for an event such as major incident, planned maintenance, and release. Each plan generally involves a series of tasks that define different communication and collaboration activities along with frequency and method of communication. For each task, you must specify the communication channel such as SMS, email, or conference, for contacting the stakeholders. You can also define templates for email and SMS messages.

After defining the task and channel for communication, you need to define the contacts or the target audience to be contacted for each task as well as the responsibility that is expected of them. The contact type can be user, group, or a list of recipients added dynamically.

After a communication plan is defined, the plan gets associated with the appropriate task table based on the conditions defined. Thereafter, the tasks defined in the plan get executed sequentially and stakeholders are contacted as defined in the plan. The communication plan makes communication and collaboration process smoother and brings a quicker resolution of the issue.

Task communications management flow in major incident management

Assume that you want an incident communication plan generated for a high priority major incident.

- An incident manager can pre-define a communication plan and the conditions that drive its attachment. In this case, conditions are: Priority = High and Major Incident state = Accepted. Let us consider that the target audience is technical stakeholders of the incident and the communication plan definition is named Technical Communications.
- The plan definition can have multiple communication task definitions such as:
  - Initiate Technical Communications
  - Technical Status Update
Each communication task definition also specifies the channel of communication and the communication frequency (one time or recurring).

- Initiate Technical Communications uses email as a channel of communication and communication frequency is one time.
- Technical Status Update uses email and SMS as channel of communication and the communication frequency is recurring.

The target audience for the communications is defined as communication contact definitions on the plan definition. In this case, consider Service owners of the affected CIs related to the incident as technical stakeholders.

When an incident meets these conditions, an incident communication plan together with its tasks gets attached to the incident record.

The major incident manager can now effectively carry out the communication without any delay in the resolution of the major incident.

Task Communications Management plugin

- Existing customers, who have activated Incident Management - Major Incident Management plugin (com.snc.incident.mim) or Incident Communications Management plugin (com.snc.iam), the Task Communications Management plugin (com.snc.task_communication_management) is also activated by default.

- The Task Communications Management plugin is activated when you activate the Incident Management - Major Incident Management plugin (com.snc.incident.mim).

Note: With the activation of the Task Communications Management plugin (com.snc.task_communication_management), the Contact Management plugin (com.snc.contact_management) and the Targeted Communications (com.sn_publications) plugin also get activated.

Activate Task Communication Management

The Task Communications Management plugin (com.snc.task_communication_management) is activated when you activate the Incident Communications Management plugin (com.snc.iam) or the Incident Management - Major Incident Management plugin (com.snc.incident.mim). This plugin includes demo data and activates related plugins if they are not already active.

Role required: admin

Task Communications Management activates these related plugins if they are not already active.

Table 1197: Plugins for Task Communications Management

<table>
<thead>
<tr>
<th>Plugin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact Management [com.snc.contact_management]</td>
<td>The Contact Management plugin manages the connections between users or groups and other resources in the system.</td>
</tr>
<tr>
<td>Plugin</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Targeted Communications</td>
<td>The Targeted Communications plugin provides a way to publish and send out</td>
</tr>
<tr>
<td>[com.sn_publications]</td>
<td>newsletter like articles to targeted internal or external customers.</td>
</tr>
</tbody>
</table>

Installed with Task Communications Management

Several types of components are installed with the Task Communications Management (TCM) plugin.

Tables installed with Task Communications Management

Tables are added with the activation of Task Communications Management. Task Communications Management adds the following tables.

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Plan Type Lookup</td>
<td>Stores the communication plan types.</td>
</tr>
<tr>
<td>[comm_plan_type_lookup]</td>
<td></td>
</tr>
<tr>
<td>Communication Task Type Lookup</td>
<td>Stores the communication task types.</td>
</tr>
<tr>
<td>[comm_task_type_lookup]</td>
<td></td>
</tr>
<tr>
<td>Communication Plan Definition</td>
<td>The definition table for the communication plan entity.</td>
</tr>
<tr>
<td>[comm_plan_definition]</td>
<td></td>
</tr>
<tr>
<td>Communication Task Definition</td>
<td>The definition table for the communication task entity.</td>
</tr>
<tr>
<td>[comm_task_definition]</td>
<td></td>
</tr>
<tr>
<td>Communication Channel Definition</td>
<td>Master table for channel definitions.</td>
</tr>
<tr>
<td>[comm_channel_definition]</td>
<td></td>
</tr>
<tr>
<td>Communication Channel Definition - Email</td>
<td>Defines email as a channel.</td>
</tr>
<tr>
<td>[comm_channel_def_email]</td>
<td></td>
</tr>
<tr>
<td>Communication Channel Definition - SMS</td>
<td>Defines SMS as a channel.</td>
</tr>
<tr>
<td>[comm_channel_def_sms]</td>
<td></td>
</tr>
<tr>
<td>Communication Channel Definition - Conference</td>
<td>Defines Conference as a channel.</td>
</tr>
<tr>
<td>[comm_channel_def_conference]</td>
<td></td>
</tr>
<tr>
<td>Communication Contact Definition</td>
<td>Defines the contacts for sending out communications. Contacts can be users,</td>
</tr>
<tr>
<td>[comm_contact_definition]</td>
<td>groups, or recipient lists.</td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Communication Channel Configuration [comm_channel_config]</td>
<td>Lists all available channels for an instance.</td>
</tr>
<tr>
<td><strong>Note:</strong> Configuration script for each channel is a script include.</td>
<td></td>
</tr>
<tr>
<td>Communication Plan [comm_plan]</td>
<td>Stores the communication plan that outlines the communication activity during an event.</td>
</tr>
<tr>
<td>Communication Task [comm_task]</td>
<td>Stores the task to be carried out to communicate with the involved contacts.</td>
</tr>
<tr>
<td>Communication Channel - Email [comm_channel_email]</td>
<td>Stores records that indicate email is used as a communication channel for a communication task.</td>
</tr>
<tr>
<td>Communication Channel - SMS [comm_channel_sms]</td>
<td>Stores records that indicate SMS is used as a communication channel for a communication task.</td>
</tr>
<tr>
<td>Communication Channel - Conference [comm_channel_conference]</td>
<td>Stores records that indicate conference is used as a communication channel for a communication task.</td>
</tr>
<tr>
<td>Communication Task Handler [comm_task_handler]</td>
<td>Lists specific handlers for various task types. Example: For incident, CommunicationManagementIncidentHandler.</td>
</tr>
<tr>
<td><strong>Note:</strong> The admin cannot delete this table.</td>
<td></td>
</tr>
</tbody>
</table>

Roles installed with Task Communications Management

Roles are added with the activation of Task Communications Management. Task Communications Management adds the following roles.

<table>
<thead>
<tr>
<th>Role title [name]</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Plan Admin [sn_comm_management.comm_plan_admin]</td>
<td>Provides overall accountability of Task Communications Management. This role has create and edit access to Task Communications Management tables including Communication Plan Definitions and other related records.</td>
</tr>
<tr>
<td><strong>Contains roles</strong></td>
<td>• Notify_admin&lt;br&gt;• Sn_publications_recipients_list_user</td>
</tr>
<tr>
<td>Role title [name]</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Communication Plan Viewer</td>
<td>This role has read access to Task Communications Management tables.</td>
</tr>
<tr>
<td>Communication Plan Manager</td>
<td>This role has create and edit access to Task Communications Management instance tables such as Communication Plans, Communication Tasks. Users with this role can send ad hoc communications.</td>
</tr>
</tbody>
</table>

Business rules installed with Task Communications Management

Business rules are added with the activation of Task Communications Management. Task Communications Management adds the following business rules.

<table>
<thead>
<tr>
<th>Business rule</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Validate Communication Plan type</td>
<td>Communication Plan Definition [comm_plan_definition]</td>
<td>Validates that a correct communication plan type is associated with a plan definition record.</td>
</tr>
<tr>
<td>Validate Communication Task type</td>
<td>Communication Task Definition [comm_task_definition]</td>
<td>Validates that the source, plan definition, and the communication plan type are in synchronization with each other.</td>
</tr>
<tr>
<td>Validate Source, Plan Definition &amp; Type</td>
<td>Communication Plan [comm_plan]</td>
<td>Validates that the source, plan definition, and the communication plan type are in synchronization with each other. For example, if the source is an incident, then the plan definition and the type that you chose must be defined on the incident table.</td>
</tr>
<tr>
<td>Validate Task Definition, type</td>
<td>Communication Task [comm_task]</td>
<td>Validates that the communication task definition and type fields are in synchronization with the communication task record.</td>
</tr>
<tr>
<td>Attach Communication Plans</td>
<td>Task [task]</td>
<td>This attaches the communication plans on the relevant task record when the condition mentioned in the communication plan definition matches.</td>
</tr>
<tr>
<td>Business rule</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Validate Channel Definition</td>
<td>Communication Channel definition [comm_channel_definition]</td>
<td>This enforces the mutual exclusiveness of Conference as a channel definition.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> If Conference is added as a channel definition, then you cannot add email or SMS as a channel for that communication task definition. A communication task definition can have both email and SMS as channel definitions.</td>
</tr>
<tr>
<td>Validate Channel</td>
<td>Communication Channel [comm_channel]</td>
<td>Validate Channel business rule enforces the mutual exclusiveness of Conference as a channel. For example, if Conference is added as a channel, then you cannot add email or SMS as a channel for that communication task. A communication task can have both email and SMS as channels.</td>
</tr>
<tr>
<td>Conference call allowed</td>
<td>Communication Task [comm_task]</td>
<td>Decides whether conference call initiation should be allowed on the communication task record in its current state.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> If a conference call is already in progress for a communication task, you cannot initiate a new conference call for the same communication task until the previous call ends.</td>
</tr>
<tr>
<td>Sync Conference Call status</td>
<td>Notify Conference Call [notify_conference_call]</td>
<td>This keeps the conference call state and the conference channel state in synchronization.</td>
</tr>
</tbody>
</table>

**UI policies installed with Task Communications Management**

UI policies are added with the activation of Task Communications Management.

Task Communications Management adds the following UI policies.
<table>
<thead>
<tr>
<th>UI policy</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Type is Consumer (active when sn_customerservice plugin is activated)</td>
<td>Communication Contact Definition [comm_contact_definition]</td>
<td>These four UI policies on the Communication Contract Definition table [comm_contact_definition] show respective fields only when you select the related value from the Type choice list.</td>
</tr>
<tr>
<td>• Type is Group</td>
<td>Communication Plan Definition [comm_plan_definition]</td>
<td>Displays the Condition field on the Communication Plan Definition table [comm_plan_definition] only when the Condition based check box is selected.</td>
</tr>
<tr>
<td>• Type is User</td>
<td>Communication Plan [comm_plan]</td>
<td>When you provide the Communication plan definition value, the Communication plan definition and the table field are set as read only on loading.</td>
</tr>
<tr>
<td>• Type is Recipient List</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Script includes installed with Task Communications Management**

Script includes are added with the activation of Task Communications Management.

Task Communications Management adds the following script includes.

<table>
<thead>
<tr>
<th>Script include</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CommunicationManagementBridgeSNC</td>
<td>The main script include that provides implementations for other tasks. If no implementation is found, default handling is done per CommunicationManagementDefaultHandlerSNC.</td>
</tr>
<tr>
<td>CommunicationManagementDefaultHandlerSNC</td>
<td>Default handler for communicationcanagement common tasks. This handler is used if there is no specific script include shipped in comm_task_handler table.</td>
</tr>
<tr>
<td>CommunicationManagementRestHandlerSNC</td>
<td>Includes functionality for creating ad hoc communication plan or tasks, and provides utilities for capturing details in the communication clan.</td>
</tr>
<tr>
<td>CommunicationManagementUtilSNC</td>
<td>Includes functionality for syncing channels and communication tasks and provides utilities for the Task Communication Management flow.</td>
</tr>
<tr>
<td>CommunicationPlanEngineSNC</td>
<td>Includes functionality for associating communication plans with the task record.</td>
</tr>
<tr>
<td>CommunicationManagementChannelConferenceConfigSNC</td>
<td>Provides functionality to fetch configuration details for the conference channel.</td>
</tr>
<tr>
<td>CommunicationManagementChannelEmailConfigSNC</td>
<td>Provides functionality to fetch configuration details for the email channel.</td>
</tr>
</tbody>
</table>
### Working with Task Communications Management

The section covers topics that help you with a variety of technical concepts related to Task Communications Management such as creating communication plan definition, task definition, channel definition, and contact definition.

#### Create communication plan definition

Create a communication plan definition to specify communication task and contact definitions. You can define communication frequency for each task along with communication channels and templates for messaging.

Role required: sn_comm_management.comm_plan_admin or admin

2. On the form, fill in the fields.

<p>| Table 1198: Communication Plan Definition form |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name for the communication plan.</td>
</tr>
<tr>
<td>Table</td>
<td>Table to which the plan is to be attached when the conditions are met.</td>
</tr>
<tr>
<td>Type</td>
<td>Type of communication plan such as Technical, Internal, External, Customer.</td>
</tr>
<tr>
<td>Order</td>
<td>Order in which the communication plans must get associated to the table.</td>
</tr>
<tr>
<td>Condition based</td>
<td>Check box to define whether the plan is attached to a table based on conditions. For example, if you want a communication plan to get attached to an incident of priority = 2, you can mention the condition in the Condition field.</td>
</tr>
<tr>
<td>Active</td>
<td>Check box to define whether the plan definition is active.</td>
</tr>
<tr>
<td>Description</td>
<td>Detailed description of the plan definition.</td>
</tr>
<tr>
<td>Condition</td>
<td>Condition under which a communication plan gets attached to a table.</td>
</tr>
</tbody>
</table>
3. Click Submit.
   The communication plan is submitted. The communication plan definition contains the following related lists:
   - Communication Task Definitions
   - Communication Contact Definitions

Create communication tasks for the plan.

Create communication task definition

Create a communication task for a communication plan. When a plan gets attached to a table, the tasks related to the plan need to be executed to resolve the issue. You can associate multiple tasks with a communication plan.

You have defined a communication plan.

Role required: sn_comm_management.comm_plan_admin

1. Click the Communication Task Definitions related list and then click New.
2. On the form, fill in the fields.

Table 1199: Communication Task Definition form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name for the communication task definition.</td>
</tr>
<tr>
<td>Type</td>
<td>Type of task such as internal communication, that is applicable to a particular table or globally.</td>
</tr>
<tr>
<td>Order</td>
<td>Order in which the communication tasks appear in the plan. This field indicates which communication task to execute first.</td>
</tr>
<tr>
<td>Active</td>
<td>Check box to define whether the task is active or not.</td>
</tr>
<tr>
<td>Description</td>
<td>Detailed description of the task definition.</td>
</tr>
<tr>
<td>Communication frequency</td>
<td>Frequency of the communication task execution. You can send the notification once or the notification can be repeated.</td>
</tr>
<tr>
<td>Duration</td>
<td>Time by which you want to send a notification. For example, if the communication frequency is One time and the Duration is 15 minutes, then the notification is sent only once within 15 minutes. If the Communication frequency is Recurring, then the notification is sent every 15 minutes.</td>
</tr>
</tbody>
</table>

3. Click Update.

Create communication channel definition for the task.
Create communication channel definition

Create a communication channel for each communication task to determine which mode of communication to use for the task when a plan is attached to a table.

You have defined a communication plan.

Role required: sn_comm_management.comm_plan_admin

- There are three modes of communication available: email, SMS, and conference.
- For the incident table, the functionality for SMS and conference appears only if you activate the Notify plugin (com.snc.notify) and the com.snc.iam.notify_number property value is set to the registered notify number. The notify number is registered while configuring the Twilio account.
- Add Channel – Conference is mutually exclusive to Add Channel – SMS and Add Channel – Email. If you add Add Channel – SMS, the Add Channel – Email related link appears but not the Add Channel – Conference related link. Similarly, if you add Add Channel – Email, the Add Channel – SMS related link appears but not the Add Channel – Conference related link.

1. On the Communication Task Definition form, click any one of the following related links based on your requirement:
   - Add Channel – Conference
   - Add Channel – Email
   - Add Channel – SMS

2. On the form, fill in the fields.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add Channel – Conference</td>
<td>Communication task definition this channel definition is associated with.</td>
</tr>
</tbody>
</table>
| Email client template   | Lookup icon to select the email client template used to send emails to the targeted audience.  
                         | **Note:** This email template must be defined on the Communication task table. |
| Add Channel – SMS       | Communication task definition this channel definition is associated with.   |
| Notify SMS template     | Lookup icon to select the notify sms template used to send an sms to the targeted audience. 
                         | **Note:** This email template needs to be defined on the Communication task table. |
3. Click Submit.

After creating communication tasks and communication channels for those tasks, create contacts for the communication plan.

Create communication contact definition

Define the recipients of a particular plan to determine the target audience involved in each communication task and the responsibilities the recipients are expected to handle. A notification that is sent for a task is sent to all individuals specified for that task.

You have defined a communication plan.

Role required: sn_comm_management.communication_plan_admin

You can add or remove any particular communication contact manually.

1. Click the Communication Contact Definitions related list and then click New.
2. On the form, fill in the fields.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Type of contact that you want to involve in the plan. The contact type is assigned dynamically at the time of the table execution.</td>
</tr>
<tr>
<td>Responsibility</td>
<td>Responsibility that the user or group or the individuals in the recipient list are expected to handle.</td>
</tr>
<tr>
<td>User</td>
<td>Name of the user, group, or recipient list to be added to the contact list.</td>
</tr>
</tbody>
</table>

**Note:** Use the recipient list to specify a dynamic criteria for fetching the list of users for a particular communication plan.

3. Click Submit.

Define a recipient list for communication contact

Dynamically define the recipients of a particular communication plan using the recipient list.

You have defined a communication plan.

Role required: sn_comm_management comm_plan_admin

Sometimes, the members you want to include in a plan can only be known dynamically. For example, you might want the support group associated with a particular business service in an incident to be involved in the communication plan. The support group might change depending on the business service that you select. In such a case, a recipient list provides the flexibility to add recipients dynamically.

1. Navigate to Task Communications Management Administration Recipients Lists.
3. On the form, fill in the fields.
Table 1202: Recipients Lists form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the recipient list.</td>
</tr>
<tr>
<td>Type</td>
<td>Type of recipients such as internal users, accounts, contacts.</td>
</tr>
<tr>
<td>State</td>
<td>Role that the user, group, or the individuals in the recipient list plays.</td>
</tr>
</tbody>
</table>

Setup

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Different methods used to define the recipients:</td>
<td></td>
</tr>
<tr>
<td>• Upload File: Upload an Excel file with the recipient information. This list is static.</td>
<td></td>
</tr>
<tr>
<td>• Dynamic Condition: Use scripts or conditions to receive recipient information.</td>
<td></td>
</tr>
</tbody>
</table>

4. Click Submit.

Create communication contacts for the task.

Define plan type

Define the communication plan type and specify whether the plan type is applicable to a particular table or globally. When you create the communication plan type, it is referenced in the communication plan definition.

Role required: sn_comm_management.comm_plan_admin

The value in the Type field helps you filter the plan by its type, generate a report of a particular plan type, or create SLAs for any communication plan.

1. Navigate to Task Communication Management Administration Plan Types, and click New.
2. On the form, fill in the fields.

Table 1203: Communication Plan Type Lookup form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the communication plan type.</td>
</tr>
<tr>
<td>Global</td>
<td>Check box to determine whether the plan type is available for all tables or for a specific table. If the check box is not selected, the Table field appears where you can select the table for which the plan type appears.</td>
</tr>
<tr>
<td>Application</td>
<td>Application scope of the plan type. The plan type is available for all applications or for scoped applications.</td>
</tr>
<tr>
<td>Active</td>
<td>Check box to define whether the plan type is active.</td>
</tr>
<tr>
<td>Description</td>
<td>Detailed description of the plan type.</td>
</tr>
</tbody>
</table>

3. Click Submit.
Create a communication plan definition.

Define task type

Define the type of the communication task and specify whether the task is applicable to a particular table or applicable globally.

Role required: sn_comm_management.comm_plan_admin

The value in the Type field helps you filter a task by its type, generate a report of a particular task type, or create SLAs for any communication task.

1. Navigate to Task Communication Management Administration Task Types, and click New.
2. On the form, fill in the fields.

Table 1204: Communication Task Type Lookup form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the communication task type.</td>
</tr>
<tr>
<td>Global</td>
<td>Check box to determine whether the task type is available for all tables or for a specific table. If the check box is not selected, the Table field appears where you can select the table the task type appears for.</td>
</tr>
<tr>
<td>Application</td>
<td>Application scope of the task type. The task type is available for all applications or for scoped applications.</td>
</tr>
<tr>
<td>Active</td>
<td>Check box to define whether the task type is active or not.</td>
</tr>
<tr>
<td>Description</td>
<td>Detailed description regarding the type of the task.</td>
</tr>
</tbody>
</table>

3. Click Submit.

Create a communication task definition.

Define contact responsibilities

Define the different contacts or target audience involved in the communication process and the responsibility that those contacts are expected to manage throughout the process. Define the contact responsibility name such as Business Director or Duty Manager, type of the contact such as user, group, or recipient, and the task table the contact is associated to.

Role required: sn_comm_management.comm_plan_admin

1. Navigate to Task Communication Management Administration Contact Responsibilities, and click New.
2. On the form, fill in the fields.

Table 1205: Contact Responsibility form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global</td>
<td>Check box to determine whether the contact responsibility is available for all tables or for a specific table. If the check box is not selected, the Table field appears where you can select the table the contact responsibility appears for.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Name</td>
<td>Name of the contact involved in the communication process.</td>
</tr>
<tr>
<td>Type</td>
<td>Type of contact.</td>
</tr>
<tr>
<td>Table</td>
<td>Table on which contact is activated when a communication plan is attached.</td>
</tr>
</tbody>
</table>

3. Click Submit.

Create communication contacts for the task.

**View communication channel configuration**

You can define different communication channels that are used to contact the target audience in the communication process. By default, the communication channels available are e-mail, SMS, and conference.

Role required: sn_comm_management.comm_plan_admin

An admin only has read access to the Channel Configuration module. If you want to create a new channel configuration, request through the HI Customer Service system.

1. Navigate to Task Communication Management Administration Channel Configuration and click New.
2. On the form, fill in the fields:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Mode of channel such as e-mail, SMS, conference.</td>
</tr>
<tr>
<td>Configuration script</td>
<td>Lookup icon to select the script that defines the channel configuration.</td>
</tr>
<tr>
<td>Active</td>
<td>Check box to define whether the communication channel is active or not.</td>
</tr>
</tbody>
</table>

3. Click Submit.

**Timeline Visualizations**

A timeline visualization is a representation of an organization's activities over time.

Typically, timeline visualizations are useful for quickly assessing the impact of future strategic and operational activities such as change requests and projects. Timeline visualizations come in two varieties: a two-dimensional (2D) view where activities are grouped by month, and a three-dimensional (3D) view where activities are grouped in lanes. Both views are interactive, and the 2D view can be printed.

Timeline administrators, users with the timeline_admin role, can set up visualizations to represent ITSM-related activities, such as incidents, problems, changes, and projects. Timeline administrators or users with the timeline_user role can personalize their timeline visualizations from the Settings pane in the visualization.
The CIO Roadmap timeline visualization shows your organization’s projects grouped by portfolios. Organizational leaders can use the CIO Roadmap to monitor and evaluate the status of current and upcoming projects.

**Note:** Activating timeline visualizations does not activate predefined CIO roadmap. You require PPM (com.snc.financial_planning_pmo) plugin to use CIO roadmap.

**Key terms for timeline visualizations**

- **Lane**: A logical grouping of items on the 3D timeline visualization. For example, one lane might show pending projects while another lane shows open projects.
- **Panel**: A block that represents an item record in a 2D timeline visualization, or a block that represents one or more item records in a 3D timeline visualization.
- **Summary view**: A pop-up window that appears when a user clicks a panel in either the 2D or 3D timeline visualization. The summary view contains additional information about the record. Timeline administrators configure the information that appears in the summary view.
- **Marker**: A bar indicating the start of a month in a 3D timeline visualization.
- **Slider**: A tool used to control the time period seen in a 3D visualization.
- **Slider track**: An alternative view of the panels displayed in both the 2D and 3D timeline visualization.
Activate Timeline Visualization

An administrator can activate the Timeline Visualization plugin (com.snc.timeline_visualization) to access the functionality.

To use the CIO roadmap with timeline visualization, you must activate Project Portfolio Management (com.snc.financial_planning_pmo) plugin.

1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.
   - If the plugin depends on other plugins, these plugins are listed along with their activation status.
   - If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).
4. If available, select the Load demo data check box.
   - Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.
   - You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.
5. Click Activate.
Installed with Timeline Visualizations

Several components are installed with timeline visualizations.

Tables

Timeline visualization adds the following table.

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timeline Visualization [roadmap_page]</td>
<td>Stores all available timeline visualizations.</td>
</tr>
<tr>
<td>Personalize Timeline [roadmap_user_page]</td>
<td>Stores timeline personalization settings for all timeline visualizations.</td>
</tr>
</tbody>
</table>

UI Policies

Timeline visualization adds the following UI policy.

<table>
<thead>
<tr>
<th>Name</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Timeline Visualization configuration Page to enable/disable certain fields</td>
<td>Timeline Visualization [roadmap_page]</td>
<td>Script that hides fields in the Timeline Visualization form when the form loads.</td>
</tr>
</tbody>
</table>

Script Includes

Timeline visualization adds the following script includes.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roadmap2DUtil</td>
<td>Timeline Visualization - 2D API to generate data for lanes and panels.</td>
</tr>
<tr>
<td>RoadmapCommonUtil</td>
<td>Timeline visualization common utility to handle generic functions.</td>
</tr>
<tr>
<td>RoadmapConfig</td>
<td>Timeline visualization utility allowing configuration through the Timeline Visualization [roadmap_page] table.</td>
</tr>
<tr>
<td>RoadmapItems</td>
<td>Timeline visualization utility to get lane items.</td>
</tr>
<tr>
<td>RoadmapUtil</td>
<td>API to generate data for lanes and panels.</td>
</tr>
</tbody>
</table>

Client Scripts

Timeline visualization adds the following client scripts.
<table>
<thead>
<tr>
<th>Name</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roadmap Color Choice</td>
<td>Timeline Visualization [roadmap_page]</td>
<td>Sets color values for the color choice fields in the timeline visualization configuration page.</td>
</tr>
<tr>
<td>Roadmap Item Table</td>
<td>Timeline Visualization [roadmap_page]</td>
<td>Allows changing the color fields for the item_color_key whenever there is a change to the panel table.</td>
</tr>
<tr>
<td>Roadmap On Load</td>
<td>Timeline Visualization [roadmap_page]</td>
<td>Loads the personalized version of the roadmap/visualization.</td>
</tr>
<tr>
<td>Roadmap Panel Table Change</td>
<td>Timeline Visualization [roadmap_page]</td>
<td>Allows changing the field name for item_color_key whenever there is a change to the panel/visualization table.</td>
</tr>
</tbody>
</table>

**Business Rules**

Timeline visualization adds the following business rule.

<table>
<thead>
<tr>
<th>Name</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check only one default</td>
<td>Timeline Visualization [roadmap_page]</td>
<td>Checks if another visualization is already set as default when user sets a new visualization as the default.</td>
</tr>
</tbody>
</table>

**Timeline visualizations roles**

Timeline visualizations provides two roles.

**Table 1207: Roles**

<table>
<thead>
<tr>
<th>Role Title [Name]</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timeline administrator [timeline_admin]</td>
<td>Create and edit timeline visualization pages and view timeline visualizations.</td>
</tr>
<tr>
<td>Timeline user [timeline_user]</td>
<td>View timeline visualizations. Timeline user access is also granted to users with the project_manager and project_user roles.</td>
</tr>
</tbody>
</table>

**Create a Timeline Visualization**

Set up timeline visualizations for the organization’s leaders by creating a timeline that provides visual representations of the organization's operational and strategic activities.

Role required: timeline_admin

Additionally, create timeline visualization views to define what data appears in the summary window when a user clicks a panel on the timeline.
**Note:** Activating timeline visualizations doesn’t activate predefined CIO roadmap. You require PPM (com.snc.financial_planning_pmo) plugin to use CIO roadmap.

- Navigate to Timeline Visualization Create New and create a new record.
Figure 654: Timeline visualization configuration form
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Unique name for the visualization.</td>
</tr>
<tr>
<td>Panel table</td>
<td>Table that provides the records displayed as lanes and panels in the timeline. Note: The list shows only tables and database views that are in the same scope as the visualization.</td>
</tr>
<tr>
<td>Relationship field</td>
<td>Field on the table that contains values displayed as lane titles. Typically this field is a reference field or a field that contains a limited range of values. Note: The CIO Roadmap timeline visualization is a ServiceNow customized visualization for the Project application that does not use the Relationship field.</td>
</tr>
<tr>
<td>Show slider</td>
<td>Check box that enables (selected) or disables (cleared) displaying the timeline slider that users move to change the dates shown.</td>
</tr>
<tr>
<td>Panel name</td>
<td>Field from the Panel table that contains the values displayed in the panel body.</td>
</tr>
<tr>
<td>Panel date</td>
<td>Field from the Panel table that contains the date values displayed in the panel head in 3D view and in the panel body in 2D view. These dates also determine placement of panels on a lane. Only date and date-time fields are available on the choice list.</td>
</tr>
<tr>
<td>Default</td>
<td>Check box that sets (selected) or removes (cleared) the default status of a visualization when you have more than one defined for a specific table. Applications that include a visualization use the default visualization.</td>
</tr>
<tr>
<td>Max items per lane</td>
<td>Maximum number of items that are displayed in a lane in 3D view. The default value is 500. Note: The field is not visible on the form by default. Configure the form to add this field.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Max items per lane 2d</td>
<td>Maximum number of items that are displayed in a lane in 2D view. The default value is 99. <strong>Note:</strong> The field is not visible on the form by default. Configure the form to add this field.</td>
</tr>
</tbody>
</table>

**Table 1209: Timeline visualization configuration filtering and sorting form field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane condition</td>
<td>Condition builder used to create filters and apply sorting to values that are used as lanes in 3D view visualizations. For example, if you set [Name] [is not] [IT] as a lane condition for the CIO Roadmap, then IT no longer appears as a lane in the roadmap, nor does it appear as a lane option in the Settings pane. Removing the filter restores the IT lane to the visualization and to lane options in the Settings pane. To order the results, specify sorting based on relevant field names. For example, to order the portfolio names so that they appear in reverse alphabetical order on the CIO Roadmap, set the sort fields to [Name] [z to a].</td>
</tr>
<tr>
<td>Panel condition</td>
<td>Condition builder used to create filters and apply sorting to values that are used as panels in 2D and 3D view visualizations. For example, if you set [State] [is one of] [Pending, Open, Work in Progress] as the panel condition for the CIO Roadmap, only projects that are in one of those states appear on the roadmap.</td>
</tr>
</tbody>
</table>
### Table 1210: Timeline visualization configuration color options form field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel color key</td>
<td>Field from the Panel table that contains values used for color coding the information displayed. The field selected here determines the values that are available in the Label fields on the form.</td>
</tr>
<tr>
<td></td>
<td>The CIO Roadmap uses State, which is a field in the Project table. Panels on the CIO Roadmap are color coded according to the project state, which can be Pending, Open, Work in Progress, Closed Complete, Closed Incomplete, and Skipped.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> You require PPM (com.snc.financial_planning_pmo) plugin to use CIO roadmap.</td>
</tr>
<tr>
<td></td>
<td>Examples of other fields that are suitable for this selection include Priority, Risk, and Approval.</td>
</tr>
<tr>
<td>Label 1</td>
<td>Values to be color coded. The values available are determined by the Panel color key field. For example, the CIO Roadmap is based on the Project table and has the Panel color key set to the State field, which contains the values Pending, Open, Work in Progress, Closed Complete, Closed Incomplete, and Closed Skipped.</td>
</tr>
<tr>
<td>Label 2</td>
<td>You can set specific colors for up to four values from the selected field. Other values are shown in the Default color.</td>
</tr>
<tr>
<td>Label 3</td>
<td></td>
</tr>
<tr>
<td>Label 4</td>
<td></td>
</tr>
<tr>
<td>Default color</td>
<td>Color applied to values that are not selected for labels. For example, the CIO Roadmap color codes and creates labels for the values Pending, Open, Work in Progress, and Closed Complete. The additional values, Closed Incomplete and Closed Skipped, use the default color.</td>
</tr>
<tr>
<td>Color 1</td>
<td>Colors that correspond to each of the Label field values. For example, if Label 1 is the Pending state, and Color 1 is red, then panels for projects in the pending state are red.</td>
</tr>
<tr>
<td>Color 2</td>
<td></td>
</tr>
<tr>
<td>Color 3</td>
<td></td>
</tr>
<tr>
<td>Color 4</td>
<td></td>
</tr>
</tbody>
</table>
Create a Timeline Visualization view

The timeline visualization view determines which record details appear in the pop-up summary window when a user clicks a panel.

You can create one timeline visualization view per table. For example, if your view shows incident records, you can create a view on the Incident table to show only certain information, such as the incident number, priority, and short description.

If no Timeline Visualization view exists, all panels use the default view that shows all the fields that currently appear on the default view of the form for that table. After you create a Timeline Visualization view for a table, all panels then use that view.

For example, to create a Timeline Visualization view using the Incident form:

1. Navigate to Incident All.
2. Open an incident.
3. Right-click the form header and select Configure Form Layout.
4. Under Form view and section, go to the View name field and select New.
5. Enter timeline visualization in the View name field.
6. Click Ok to create the timeline visualization view.
7. Add fields to or remove items from the timeline visualization view using the Available and Selected columns.
8. Click Save.

Planning Your Timeline Visualization

Before creating a timeline visualization, you should have a clear idea of the information that you want to display.

This planning process helps you identify the required table and fields, and determine filtering and sorting requirements. Since users can personalize the visualization, avoid setting restrictive filters that may prevent users from finding categories that they are accustomed to seeing. You can use the CIO Roadmap as a starting point for creating your own timeline visualizations.

Note: Activating timeline visualizations doesn't activate predefined CIO roadmap. You require PPM (com.snc.financial_planning_pmo) plugin to use CIO roadmap.

Use Timeline Visualization

Timeline Visualization provides a high-level view of an organization's strategic and operational activities over time.

Organizational decision makers can use the information in visualizations for activities such as planning future projects and estimating resource requirements. Users can personalize the information displayed with the visualization Settings pane.

Activating the Timeline Visualization application does not install the CIO Roadmap. You require PPM (com.snc.financial_planning_pmo) plugin to use CIO roadmap. CIO Roadmap is a timeline visualization that displays an organization's IT projects and portfolios. This following sections use the CIO Roadmap to demonstrate features of timeline visualizations.
Lanes, markers, and panels

Lanes, markers, and panels are the fundamental elements of a timeline visualization. appear in the 3D view only.

**Note:** Lanes and markers are available in the 3D view only. A panel in the 2D view always represents a single record, while panels in 3D view may represent one or more records.

**Lanes**

A lane is a channel in which activities are grouped. A visualization can display up to eight lanes at a time. While viewing a visualization, you can use the Settings pane to show or hide individual lanes.

**Note:** The number of items displayed in a lane depends on the Max items per lane and Max items per lane 2d settings on *Timeline Visualization form.*

**Markers**

Markers are horizontal lines that cross all lanes and identify a transition to the next month.

**Panels**

Panels in both 2D and 3D views are color coded according to values that the administrator selects during the initial setup.

In 2D view, panels are grouped by month and stacked in chronological order, from the earliest date to the latest date. By default, the 2D view opens with the current month displayed on the left side of the visualization. You can print visualizations from the 2D view using the browser's print option. In 3D view, panels are grouped in lanes and ordered by date, from earliest to latest. The date that appears on the panel determines its placement in 2D and 3D view. The date displayed is based on a value the timeline administrator selects during initial setup.

Panels appear in the CIO Roadmap according to the planned completion date for the project. In 3D view, projects with the same planned date of completion are consolidated into a single panel. In 2D view, projects with the same planned date of completion are displayed as individual panels.
Panel headers in the CIO Roadmap are color coded based on project state. However, in 3D view, if a panel represents more than one project, the panel header is colored black. The Settings pane contains a key showing each available project state and the corresponding color.

**Note:** Activating timeline visualizations doesn’t activate predefined CIO roadmap. You require PPM (com.snc.financial_planning_pmo) plugin to use CIO roadmap.

To view additional information about a panel:

- Click a panel for a single record while in 2D or 3D view to open a summary window that contains additional information. Click the heading in the summary window to open the full record.
- Click a panel that represents multiple records to open a list of those records. Click a record number to open the full record.

The timeline administrator can configure the information that appears in summary windows.

**Personalize Timeline Visualizations**

You can configure settings for timeline visualizations like lane and panel conditions, colors, and labels.

**Personalization**

Open the Settings pane and click Configure. Complete the form as appropriate (see table).
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane conditions</td>
<td>Condition builder used to create filters and apply sorting to values that are used as lanes in 3D view visualizations. For example, if you set [Name] [is not] [IT] as a lane condition for the CIO Roadmap, then IT no longer appears as a lane in the roadmap, nor does it appear as a lane option in the Settings pane. Removing the filter restores the IT lane to the visualization and to lane options in the Settings pane. To order the results, specify sorting based on relevant field names. For example, to order the portfolio names so that they appear in reverse alphabetical order on the CIO Roadmap, set the sort fields to [Name] [z to a].</td>
</tr>
<tr>
<td>Panel conditions</td>
<td>Condition builder used to create filters and apply sorting to values that are used as panels in the visualization. For example, if you set [State] [is one of] [Pending, Open, Work in Progress] as the panel condition for the CIO Roadmap, only projects that are in one of those states appear on the roadmap.</td>
</tr>
<tr>
<td>Panel color key</td>
<td>Field from the Panel table that contains values used for color coding the information displayed. The field selected here determines the values that are available in the Label fields on the form. The CIO Roadmap uses State, which is a field in the Project table. Panels on the CIO Roadmap are color coded according to the project state, which can be Pending, Open, Work in Progress, Closed Complete, Closed Incomplete, and Skipped. Examples of other fields that are suitable for this selection include Priority, Risk, and Approval.</td>
</tr>
<tr>
<td>Label 1</td>
<td>Values to be color coded. The values available are determined by the Panel color key field. For example, the CIO Roadmap is based on the Project table and has the Panel color key’ set to the State field, which contains the values Pending, Open, Work in Progress, Closed Complete, Closed Incomplete, and Closed Skipped. You can set specific colors for up to four values from the selected field. Other values are shown in the Default color.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Default color</td>
<td>Color applied to values that are not selected for labels. For example, the CIO Roadmap color codes and creates labels for the values Pending, Open, Work in Progress, and Closed Complete. The additional values, Closed Incomplete and Closed Skipped, use the default color.</td>
</tr>
<tr>
<td>Color 1</td>
<td>Colors that correspond to each of the Label field values. For example, if Label 1 is the Pending state, and Color 1 is red, then panels for projects in the pending state are red.</td>
</tr>
<tr>
<td>Color 2</td>
<td></td>
</tr>
<tr>
<td>Color 3</td>
<td></td>
</tr>
<tr>
<td>Color 4</td>
<td></td>
</tr>
</tbody>
</table>

**Note:**

- Activating timeline visualizations doesn't activate predefined CIO roadmap. You require PPM (com.snc.financial_planning_pmo) plugin to use CIO roadmap.
- If the Max items per lane field is set to more than 1000, you may observe a delay when displaying the timeline data using Internet Explorer (IE) as the browser.

**The Settings pane**

Element names in the Settings pane vary based on the table and fields used to create the visualization.
The Settings pane contains the following elements:

**Table 1212: Settings pane elements**

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key</td>
<td>Identifies the type of information that is color coded on the timeline, such as state or priority. It also lists the color assigned to each possible value, such as pending state and open state.</td>
</tr>
<tr>
<td>Element</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Configure</td>
<td>Allows you to personalize a visualization by creating filters on lane information and panel information, specifying sort order for results, and reassigning panel colors. These changes affect your view of the visualization only.</td>
</tr>
<tr>
<td>View</td>
<td>Allows you to switch between 2D and 3D view.</td>
</tr>
<tr>
<td>View &lt;table&gt; List</td>
<td>Opens a separate browser tab showing the complete record list for the associated table.</td>
</tr>
<tr>
<td>Portfolio</td>
<td>Allows you to click lane names to add or remove them from the visualization. While the visualization is in 2D view, the Settings pane displays a Show all &lt;records&gt; button that allows you to override lane filters applied to the initial setup.</td>
</tr>
</tbody>
</table>

Use the slider and slider track

The slider and slider track are useful for quickly navigating to any point in time on a visualization.

**Note:** Activating timeline visualizations doesn't activate predefined CIO roadmap. You require PPM (com.snc.financial_planning_pmo) plugin to use CIO roadmap.

For the CIO Roadmap, the slider track allows you to quickly view the distribution of projects over time and determine project states. While in 3D view, click and drag the slider to move the timeline forward or backward. In 2D view, click and drag the slider track right or left to move the timeline forward or backward.

The slider track provides an alternative view of panels on a visualization. For the CIO Roadmap, a colored dot in the slider track indicates the presence of one or more projects for a given day. The different dot colors correspond to different project states. This allows you to scan the slider track to identify projects of interest by their color, and then use the slider or slider track to quickly navigate to those projects. For example, if you are interested in projects that are in a pending state, you can use the slider to navigate to the colored dots that represent that state.

**Note:** Dots in the slider track do not correspond one-to-one with panels in a visualization. A dot represents the presence of one or more projects on a given date. In 3D view, if there is more than one project for a given day, all of the projects for that day are combined into a single panel on the roadmap. When the slider track is populated, projects in a multi project panel are analyzed for project state and then represented as appropriately colored dots in the slider track.

Similarly, you can use the slider or slider track in conjunction with the calendar to quickly navigate to any point in time. For example, if you are concerned about resource issues in April 2014 because you see a large cluster of dots during that time, dragging the slider or slider track to those dots brings those projects into view. Click the individual panels to view additional information.

View timeline visualization

You can view timeline visualizations from a project.

1. Navigate to Project Projects All.
2. Scroll to the bottom of the list and click the Timeline Visualization related link.
By default, the CIO Roadmap opens in three-dimensional (3D) view with the current date at the forefront of the timeline. You can use the Settings pane to change between two-dimensional (2D) and 3D view. As soon as you view a timeline visualization, it is considered personalized. After that, you see your personalized view even if the timeline administrator makes changes to the default visualization.

**Note:** Activating timeline visualizations doesn't activate predefined CIO roadmap. You require PPM (com.snc.financial_planning_pmo) plugin to use CIO roadmap.

Timeline administrators can create timeline visualizations on other tables. If you are not sure whether a timeline visualization exists for a certain application, use the application navigator to open the application of your choice, and click All. If a timeline visualization exists for the application's table, a Timeline Visualization related link appears.

### Work with timeline visualizations

There are various tools that allow you to move visualizations backward and forward in time depending on whether you are in 2D or 3D view.

The following options are available for navigating between months.

#### Table 1213: 2D views

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dragging</td>
<td>Hold down the left mouse button and drag the slider track right or left to view other months.</td>
</tr>
<tr>
<td>Left and right arrow keys</td>
<td>Press the left or right arrow keys on the keyboard to move the timeline forward or backward.</td>
</tr>
<tr>
<td>Mouse wheel button</td>
<td>Scroll the wheel to move the timeline forward or backward.</td>
</tr>
<tr>
<td>Right and left navigation arrows</td>
<td>Click the arrows to move from month to month. Arrows do not appear if there are no additional months to view.</td>
</tr>
</tbody>
</table>

The following options are available for navigating stacked panels.

#### Table 1214: Navigating stacked panels

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dragging</td>
<td>Hold down the left mouse button and drag the stack up or down to view other panels.</td>
</tr>
<tr>
<td>Up and down navigation arrows</td>
<td>Click the arrows in a stack to view additional panels for the same month. Arrows do not appear if there are no additional panels to view.</td>
</tr>
</tbody>
</table>

The following options are available for navigating in 3D view.
Virtual Agent

Virtual Agent is a conversational bot platform for providing user assistance through conversations within a messaging interface. Use Virtual Agent to build automated agents (bots) and design bot conversations that help your users quickly obtain information, make decisions, and perform common work tasks.

Watch this eight-minute video for an introduction to the Virtual Agent platform.

The Virtual Agent platform includes the following components:

**Virtual Agent conversational (client) interface**

With Virtual Agent, your users interact with a chatbot or live agent through various messaging services. Your users can use the web-based Virtual Agent interface available for Service Portal and Apple iOS and Google Android environments. They can use the Virtual Agent interface for third-party messaging applications through the ServiceNow integrations for Slack and Microsoft Teams.

**Virtual Agent Designer**

Use Virtual Agent Designer to develop, test, and deploy bot conversations that assist your users with common issues or self-service tasks. Virtual Agent Designer is a graphic tool for building the dialog flows of bot conversations, called topics. A topic defines the dialog exchanged between a virtual agent and user to accomplish a specific goal or resolve an issue.

Predefined topics are available for Customer Service Management, HR Service Delivery, and IT Service Management.

**Live Agent support**

Give users the option to switch to a human agent for assistance during bot conversations. Virtual Agent is integrated with the Live Agent module to offer a seamless transfer from a bot conversation to a live agent. With Live Agent, you specify the agent chat queues to be used, including the chat interactions transferred from a virtual agent to a human agent. Your users can request a live agent transfer at any time during a chatbot conversation. You can also initiate a live agent transfer through custom conversation flows that you build.
Benefits

Implementing a virtual agent to handle common requests and tasks enables your users to get immediate help, day or night. Providing your virtual agent on channels familiar to your users, such as third-party messaging apps, offers a convenient way for them to get work done quickly. A virtual agent can also offer personalized customer experiences by applying and remembering user information during the conversation.

Typical Tier 2 support tasks that can be accomplished with virtual agents include:

- Answering FAQs.
- Providing tutorial ("how to") information.
- Querying or updating records, for example to get status on cases or incidents.
- Gathering data, such as attachments, for the live agent.
- Performing diagnostics.
- Resolving multi-step problems.

Automating these support tasks with a virtual agent frees your support agents to focus on more complex user issues and enables you to scale your support organization accordingly.

Conversational interface

The Virtual Agent conversational interface captures an automated messaging session between the virtual agent and user. The interface uses the Service Portal web widget, which can be configured for custom service portals. The widget is available in the CSM, HR Service Delivery, and ITSM Service Portals.
A simple conversation typically includes the following elements:

- Default welcome message from the bot, followed by the first prompt for the conversation. The initial prompt asks the user to type a question, which includes a keyword to trigger the appropriate conversation or to choose from a list of available topics.
- User response to the first prompt. In this example, the user chooses the topic for opening an IT incident.
• Series of prompts, acknowledgements, and responses exchanged between the bot and user, until the user’s goal is reached or task completed. Different rich controls can be used in bot prompts, for example choice lists with buttons or a carousel of images to select an item.
• Closing message to end the conversation.

Conversation options

The conversational interface offers your users several options to manage the conversation. Users can leave the current conversation and start a new one, or contact support to get a live agent for immediate assistance.
Implementing Virtual Agent

To implement Virtual Agent, complete these initial configuration and setup steps.
Role required: admin or virtual_agent_admin

1. Activate Virtual Agent for your production and non-production instances.

   **Note:** Use your non-production instance to develop and test your Virtual Agent conversations (topics). When your topics run as expected, export the topics to your production instance and publish them to make them available on your Virtual Agent clients.

2. Activate the plugins for predefined Virtual Agent conversations.

3. Set up the Virtual Agent clients.
   a) Add the Service Portal chat widget.
   b) Optional. Load the standalone Virtual Agent web client.
   c) Install the Virtual Agent integration app for Slack and MS Teams.

4. Configure Virtual Agent branding.
   Customize Virtual Agent with your own company logo and avatar. Set the color schemes of UI elements and the support contact information displayed in the client interface.

5. Configure the basic conversation settings and customer support contacts.
   Use the Virtual Agent general settings to define the basic characteristics of a conversation, such as the welcome message and general error message displayed on all Virtual Agent clients.

   Specify the chat queues used by live agents for support.

### Activate Virtual Agent

You can activate the Glide Virtual Agent plugin (com.glide.cs.chatbot) if you have the admin role. This plugin includes activates related plugins if they are not already active.

Role required: admin

You must have a subscription for Virtual Agent before you can activate the Virtual Agent plugin. The Glide Virtual Agent plugin activates these related plugins if they are not already active.

#### Table 1216: Plugins for Glide Virtual Agent

<table>
<thead>
<tr>
<th>Plugin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual Agent Designer</td>
<td>Activates Virtual Agent Designer for building conversation flows.</td>
</tr>
<tr>
<td>[com.snc.conversation_builder]</td>
<td></td>
</tr>
<tr>
<td>Glide Conversation Server</td>
<td>Enables the Virtual Agent web clients, Connect Support, conversation branding</td>
</tr>
<tr>
<td>Virtual Agent Service Portal Widgets</td>
<td>Activates the Service Portal as a Virtual Agent web client.</td>
</tr>
<tr>
<td>[com.glide.va.sp_widgets]</td>
<td></td>
</tr>
<tr>
<td>Glide Conversation Server Adapters</td>
<td>Activates Virtual Agent adapters for third-party messaging applications.</td>
</tr>
<tr>
<td>[com.glide.cs.adapter]</td>
<td></td>
</tr>
<tr>
<td>Conversation General Settings</td>
<td>Enables Virtual Agent conversation general settings.</td>
</tr>
<tr>
<td>[com.glide.cs.settings]</td>
<td></td>
</tr>
<tr>
<td>Plugin</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>[com.glide.connect.support]</td>
<td>Enables chat in a support queue.</td>
</tr>
</tbody>
</table>

1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.
   - If the plugin depends on other plugins, these plugins are listed along with their activation status.
   - If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).
4. If available, select the Load demo data check box.
   - Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.
   - You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.
5. Click Activate.

Predefined Virtual Agent topics

Prebuilt bot conversations are available for Customer Service Management, HR Service Delivery, and IT Service Management. These topics are designed to help users with common self-service tasks in each business area, such as creating or updating incidents, or providing answers to frequently asked questions.

Plugins for predefined topics

Admins activate the predefined conversations for Virtual Agent through the following plugins:

- Customer Service Virtual Agent conversations (com.sn_csm.virtualagent)
  For details on the Customer Service topics, see Customer Service Virtual Agent conversations.
- Human Resources Scoped App: Virtual Agent Conversations (com.sn_hr_virtual_agent)
  For details on the HR topics, see HR Virtual Agent conversations.
- ITSM Virtual Agent Conversations (com.snc.itsm.virtualagent)
  For details on the ITSM topics, see ITSM Virtual Agent conversations.

Users with the virtual_agent_admin or admin roles can preview the predefined topics in Virtual Agent Designer and deploy the topics to users by publishing them.

Note: Predefined topics cannot be modified. To create a custom topic from a predefined one, duplicate and modify the topic.

Installed with Virtual Agent

Several types of components are installed with activation of the Glide Virtual Agent [com.glide.cs.chatbot] plugin, including tables and user roles.
Note: To view all other components installed with this plugin, see the Application Files table. For instructions, see Find components installed with an application.

Roles installed

<table>
<thead>
<tr>
<th>Role title [name]</th>
<th>Description</th>
<th>Contains roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual Agent Administrator [virtual_agent_admin]</td>
<td>Users who can create and manage topics (bot conversations) using Virtual Agent Designer.</td>
<td>None</td>
</tr>
<tr>
<td>External App Install Admin [external_app_install_admin]</td>
<td>Users who can install external apps such as Slack, Microsoft Teams.</td>
<td>None</td>
</tr>
</tbody>
</table>

Tables installed

Table 1217:

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adapter Configuration [sys_cs_adapter_configuration]</td>
<td>Stores records for default keywords, labels, and message values for third-party messaging applications.</td>
</tr>
<tr>
<td>Adapter Configuration Page [sys_cs_adapter_configuration_page]</td>
<td>Stores adapter configuration for third-party messaging applications. This table is the root table for sys_cs_adapter_configuration_page_slack and sys_cs_adapter_configuration_page_teams.</td>
</tr>
<tr>
<td>Client Adapter [sys_cs_client_adapter]</td>
<td>Stores each adapter state.</td>
</tr>
<tr>
<td>Consumer Channel [sys_cs_consumer_channel]</td>
<td>Stores consumer channel information.</td>
</tr>
<tr>
<td>Consumer Device Context [sys_cs_consumer_device_context]</td>
<td>Stores consumer device context information.</td>
</tr>
<tr>
<td>Conversation [sys_cs_conversation]</td>
<td>Stores a record for each conversation on the instance.</td>
</tr>
<tr>
<td>Conversation Consumer [sys_cs_consumer]</td>
<td>Stores a record representing the user in a conversation, and references the associated sys_user record for that user.</td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Conversation Media [sys_cs_media]</td>
<td>Media attached to conversations are stored in sys_attachment, and associated to this table.</td>
</tr>
<tr>
<td>Conversation Message [sys_cs_message]</td>
<td>Stores a record for each message in a conversation.</td>
</tr>
<tr>
<td>Conversation Server Connect Hand-off [sys_cs_connect_handoff]</td>
<td>Stores mapping of Virtual Agent conversations and Connect/Workspace conversations.</td>
</tr>
<tr>
<td>Conversation Session [sys_cs_session]</td>
<td>Stores a record for each conversation.</td>
</tr>
<tr>
<td>Conversation Task [sys_cs_conversation_task]</td>
<td>Stores a record for each conversation task.</td>
</tr>
<tr>
<td>Conversation Task History [sys_cs_conversation_task_history]</td>
<td>Stores history of conversation task execution.</td>
</tr>
<tr>
<td>Conversation Vendor [sys_cs_vendor]</td>
<td>Stores vendor information.</td>
</tr>
<tr>
<td>CS Consumer Account [sys_cs_consumer_account]</td>
<td>Stores third-party user information.</td>
</tr>
<tr>
<td>Live Agent Support Queue Cache [sys_cs_support_queue_cache]</td>
<td>The database cache used for support queue wait times.</td>
</tr>
<tr>
<td>Published Topic [sys_cb_design_topic]</td>
<td>Stores design topic definitions and references runtime topic.</td>
</tr>
<tr>
<td>Session Binding [sys_cs_session_binding]</td>
<td>Stores session binding and AMB channel information.</td>
</tr>
<tr>
<td>Sys CS Vendor Client Adapter Configuration [sys_cs_vendor_client_adapter_configuration]</td>
<td>Stores adapter configuration for third-party messaging applications.</td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Topic [sys_cb_topic]</td>
<td>Stores a record for each topic.</td>
</tr>
<tr>
<td>Topic [sys_cs_topic]</td>
<td>Stores an instance of a topic from sys_cb_topic at run time. Records on this table are cleaned every 12 hours.</td>
</tr>
<tr>
<td>Vendor Context Configuration [sys_cs_vendor_context_configuration]</td>
<td>Stores vendor-specific device context information.</td>
</tr>
<tr>
<td>Virtual Agent Context [sys_cs_virtual_agent_context]</td>
<td>Stores Virtual Agent context variables.</td>
</tr>
</tbody>
</table>

### Properties Installed

**Table 1218:**

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>com.glide.cs.general.error_message</td>
<td>Generic Error Message</td>
</tr>
<tr>
<td>com.glide.cs.general.live_agent_handoff_error_message</td>
<td>Error message when no live agent has been set up</td>
</tr>
<tr>
<td>com.glide.cs.general.live_agent_handoff_message</td>
<td>Message to display when handing over to a live agent</td>
</tr>
<tr>
<td>com.glide.cs.general.msg_delay</td>
<td>Minimum delay between bot messages</td>
</tr>
<tr>
<td>com.glide.cs.general.support_email</td>
<td>General Support Email</td>
</tr>
<tr>
<td>com.glide.cs.general.support_hours</td>
<td>General Support Hours</td>
</tr>
<tr>
<td>com.glide.cs.general.support_phone</td>
<td>General Support Phone</td>
</tr>
<tr>
<td>com.glide.cs.general.top_selection_message</td>
<td>Top selection message</td>
</tr>
<tr>
<td>com.glide.cs.general.type_presence_delay</td>
<td>Minimum delay before displaying typing animation</td>
</tr>
<tr>
<td>com.glide.cs.general.welcome_message</td>
<td>Welcome message</td>
</tr>
<tr>
<td>com.glide.cs.global_configuration</td>
<td>The sys_id of the default configuration page (sys_cs_configuration_page)</td>
</tr>
<tr>
<td>com.glide.cs.javascript.reserved_words</td>
<td>Reserved words in JavaScript that should not be used as valinputs names or vaVars names</td>
</tr>
<tr>
<td>com.glide.cs.live_agent_queue</td>
<td>This value is the chat queue that users transfer to when a conversation transitions from a virtual agent to a live agent. This default queue is used unless the topic specifies a specific queue to use.</td>
</tr>
</tbody>
</table>
### London ServiceNow Now Platform Capabilities

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>com.glide.cs.suggest.minimum_characters</td>
<td>This value is the minimum number of characters the user must enter in a keyword search before partial matching, phonetic matching, and spellcheck begin to function.</td>
</tr>
<tr>
<td>com.glide.cs.suggest.enable_partial_search</td>
<td>Enables partial matching searches on topic searches when set to true.</td>
</tr>
<tr>
<td>com.glide.cs.suggest.enable_phonetic_search</td>
<td>Enables phonetic searching on topic searches when set to true.</td>
</tr>
<tr>
<td>com.glide.cs.suggest.enable_spell_check</td>
<td>Enables alternate search spellings on topic searches when set to true.</td>
</tr>
</tbody>
</table>

**Domain separation and Virtual Agent**

This is an overview of domain separation and the Virtual Agent application. Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.

**Overview**

**Support: Level 1**

Domain separation is supported in this application. Not all ServiceNow applications support domain separation; some include limitations on the data and administrative settings that can be domain separated. To learn more, see *Application support for domain separation.*

Domain separation is best for those customers who:

- Need to enforce absolute data segregation between business entities (data separation).
- Customize business process definitions and user interfaces for each domain (delegated administration).
- Maintain some global processes and global reporting in a single instance.
- Separate data between customers or sub-organizations.
- The session scope is set upon session establishment to the domain listed in the user's user record. Users can manually change their session domain scope with the domain picker.
- The record scope uses the domain of the record and is active when viewing the form of any record.

By default, the record scope takes precedence over the session scope so that users in higher-level domains adhere to each record's data and process constraints. However, these users can choose to expand or collapse the domain scope to show or hide data from other domains. For example, a user in the MSP global domain also has visibility into child domains such as the ACME domain. When looking at an incident record from the ACME domain, the user can choose to expand the domain scope to show values from the MSP domain or collapse the domain scope to show only record values that match the record's ACME domain.

**Note:** Users always have access to data from domains that have been explicitly granted to them by domain visibility.

Users with the `domain_expand_scope` user role can select the domain scope from the Toggle Domain Scope UI action on the form. When record scope is in effect, the UI action can be clicked to expand the session scope and display all data available associated with the user's domain and child domain.
**Live Agent setup of Virtual Agent**

The Managed Service Provider (MSP) has one Live Agent setup record in the global domain when the instance is provisioned. The MSP can configure a separate Live Agent setup for each subdomain.

Roles required: admin, ITIL, or virtual_agent_admin

- User in a subdomain logs in and navigates to Collaboration Live Agent Setup.
- When user logs in to each subdomain, a seeded Live Agent setup record is created.

**Prerequisites**

1. User logged in to the subdomain navigates to Connect Queues.
   - Creates queues and assigns queues to the assignment groups.
   - Assigns users to the assignment groups.

2. The admin logged in to the subdomain navigates to Collaboration Live Agent Setup and assigns the default queues and the Live Agent variables to be used by virtual agents.

3. The admin sets up the transfer message and the “No Agents Available” message.

**Branding setup of Virtual Agent**

The MSP has only one global branding setup per domain-separated instance for Virtual Agent web- and portal-based clients. All subdomains share the same branding.

Roles required: admin, ITIL, or virtual_agent_admin
1. The MSP searches for Branding in the Navigator as the global domain. The user logs in as a global user in this domain.

2. The MSP assigns a logo and avatar that is the same for all subdomain Virtual Agent topics. All subdomains share the same branding.

3. The MSP applies the colors that are leveraged by all subdomains.

General settings setup of Virtual Agent

The MSP has only one general settings setup per domain-separated instance for all Virtual Agent clients. All subdomains share the same general settings.

Roles required: admin, ITIL, or virtual_agent_admin

1. The MSP searches for Virtual Agent General Settings in the Navigator as the global domain. The MSP logs in as a global user in this domain.

2. The MSP assigns generic settings to be used by all virtual agents for all subdomains:
   - Welcome message
   - Topic selection message
   - Generic error message
   - Minimum delay before displaying typing animation
   - Minimum delay between bot messages
The MSP either logs in to one of the subdomains and creates and enables topics or allows subdomain admin users to create and deploy their own topics.

Roles required: admin, ITIL, or virtual_agent_admin

To enable Virtual Agent topics, the MSP or admin user completes these steps:

1. The admin user logged in to the subdomain navigates to Collaboration Virtual Agent Designer to enable topics.
   - This can be either a global domain user impersonating a user in a subdomain or an admin user logged in to the subdomain.

2. The admin creates topics and publishes them to the instance.

3. MSP admin only: Admin can also activate either the ITSM, HR, or CSM plugin to enable base system topics for the subdomain.

4. All topics available to clients such as web, service portal, Slack, or MS Teams must be published.

5. The admin assigns roles on a particular subdomain if using roles to control which topics can be run by users.
Virtual Agent setup of messaging apps integration

The domain-separated instance has one setup record for the Slack and MS Teams messaging apps integration.

Roles required: admin, ITIL, or virtual_agent_admin

1. Customers on the subdomain license either Slack or MS Teams independent of the ServiceNow instance.
2. The admin user in the subdomain logs in and navigates to Collaboration Virtual Agent Messaging Apps Integration.
3. The admin runs the installation and sets the appropriate credentials to access the Virtual Agent bot from the third-party client.
Configure the Service Portal widget for Virtual Agent

Add the Virtual Agent Service Portal widget to a Service Portal page to enable your user to run Virtual Agent within your service portal.

Role required: admin or sp_admin

1. Navigate to Service Portal Service Portal Configuration in the navigation bar to open the service portal configuration page.
2. Click Designer to open the Service Portal Designer.
3. Select the service portal page where you want the Virtual Agent widget to appear.
4. Use the Filter Widget text box in the navigator to filter the widget list for term Virtual Agent.
5. Click and drag this widget to the bottom of the page. The widget itself appears empty, however you should see a floating blue Chat Widget at the bottom right of the page.
6. Change the color of the Virtual Agent chat icon using the widget instance parameters.
   a) Click the pencil icon in the upper right corner of the Virtual Agent widget to show the instance parameters for the widget.
b) In the Floating Button Color parameter, enter a new color for the button.

c) Click Save.

7. Set a default topic for Virtual Agent using the widget instance parameters.

a) Click the pencil icon in the upper right corner of the Virtual Agent widget to show the instance parameters for the widget.

b) In the Virtual Agent Client URL Parameters parameter, enter the text `sysparm_topic=sys_id`. Replace `sys_id` with the `sys_id` of the topic you want to use as the default.

c) Click Save.

Load the standalone Virtual Agent web client

You can load the Virtual Agent web client interface into a browser through a Virtual Agent URL link or into a web page using an iFrame.

Role required: admin or virtual_agent_admn

In a browser address bar or in an iFrame, enter this URL with your instance name: https://instance.service-now.com/$sn-va-web-client-app.do

The Virtual Agent client opens in the browser window or iFrame. For example:
Note: Use ?sysparm_skip_load_history=true parameter at the end of the URL to load the interface without the conversation history.

Virtual Agent integration with messaging applications

Enable users to run Virtual Agent bot conversations in third-party messaging applications. Use the ServiceNow Virtual Agent integration app to configure the messaging apps for your instance.
Admin and user setup

Integrating Virtual Agent with third-party messaging apps involves installation and setup tasks that admins and users perform.

Admin setup

Use the Virtual Agent integration app to configure the messaging apps for your instance. As an administrator for your ServiceNow instance and the third-party application (or working with the admin for the third-party messaging app), perform these basic installation steps to set up the Virtual Agent bot.

1. Install the ServiceNow Virtual Agent integration app and associate the app with your instance. For details, see Install Virtual Agent integrations on page 3074.

   **Note:** If you are using Slack Enterprise Grid, install the Virtual Agent bot only in a single workspace. Conversations with the bot must take place within that workspace.

2. If needed, configure the messaging text displayed in the third-party app.

   You can customize the text users see in Virtual Agent conversations by using the Adapter configuration page for third-party messaging apps.

User setup

After admins set up the Virtual Agent bot for Slack or Microsoft Teams, users link their ServiceNow user account to their Slack or Microsoft Teams account. For details, see Link your ServiceNow user account to a messaging application for Virtual Agent conversations on page 3080.

Linking accounts enables users to run Virtual Agent topics that use ServiceNow information and records. If users do not link their ServiceNow account, they can access and run only topics that have the public role.

Conversational interface in messaging integrations

The Virtual Agent interface for third-party messaging apps is similar to the web-based interface. However, there are differences in how certain options and interface controls are displayed in third-party messaging apps:

**Requesting a live agent or starting a new conversation**

Users type the keyword Hi to access options for transferring to a live agent or beginning a new conversation.
Rendering of input controls and bot responses in conversations

Input controls in Virtual Agent Designer, such as Date Time picker, Image picker, and Carousel render differently in bot conversations in messaging applications than in the web-based interface. For example, the Date Time picker control presents buttons for users to elect a date and time. Similarly, certain bot response controls, such as the Image response and Multi-flow Output, also render differently in the third-party messaging apps. For details on these differences, see the descriptions of the Virtual Agent Designer input controls, bot responses, and utilities.

Install Virtual Agent integrations

As an administrator for ServiceNow, install the ServiceNow Virtual Agent integration application and associate the app with your instance.

Install the Virtual Agent integration with Microsoft Teams
Install the Virtual Agent integration for Microsoft Teams on your instance.

Roles required:
- Admin or both virtual_agent_admin and external_app_install_admin
- Administrator for third-party applications

Note: Installing the Virtual Agent integration with Microsoft Teams creates a one-to-one association between the ServiceNow instance you are installing from and the Teams tenant in which the integration runs. Use a separate MS Teams tenant for each instance you plan to install the integration in. If you plan to test with a non-production instance and clone the instance, be sure to run the installation steps again on the clone target, to associate the bot to the new instance. Running the steps again disassociates the integration between the original non-production instance and the Teams tenant.

1. Navigate to Collaboration Messaging Apps Integration.
2. Click the Install button next to Microsoft Teams.
3. A pop-up message appears to confirm redirection to Microsoft Teams to verify your identity. Click OK.
4. Log into Microsoft Teams.
5. In the Now Virtual Agent screen, click Accept to accept the permissions for the app.
6. If the selected workspace has already been assigned to Virtual Agent, you are asked whether you want to proceed to override the previous assignment. Click Override to change the workspace, or Cancel to leave the current assignment in place.
7. After authentication, installation starts in the background. Once installation completes, a message appears confirming the installation.

8. Click the app package link to access the ServiceNow knowledge base article KB0690098, containing the application package for Microsoft Teams. Follow the steps in the article to make this package available for your MS Teams users.
9. After you see this confirmation, check for installation verification. The workspace appears below the Microsoft Teams heading on the Integration page.

Notify your users that the Virtual Agent bot for Microsoft Teams is available for use. Your users must then link their ServiceNow account to the Microsoft Teams account to access non-public Virtual Agent topics (that use ServiceNow records). For details on these steps, see Link your ServiceNow user account to a messaging application for Virtual Agent conversations on page 3080.

Install the Virtual Agent integration with Slack

Install the Virtual Agent integration for Slack and associate the app with your instance. Installing Virtual Agent with Slack creates a one-to-one association between the ServiceNow instance you are installing from and the Slack workspace in which the integration runs.

Roles required:

- Admin or both virtual_agent_admin and external_app_install_admin
- Administrator for third-party applications

Note the following important guidelines:

- If you are using Slack Enterprise Grid, which has multiple workspaces, install the Virtual Agent bot only in a single workspace. Choose the workspace where most of your end users are likely to interact with the bot. For end users, bot conversations must start and end within the same workspace.
- If you are running Enterprise Grid and use a non-production instance for testing, you must use a workspace in a different grid or use a non-grid workspace.
- If you clone the instance, the installation for the original instance will not be cloned. Run the installation steps again on the clone target, following these guidelines.

1. Navigate to Collaboration Messaging Apps Integration.
2. Click the Install button next to Slack.
   A pop-up message appears to confirm redirection to Slack to verify your identity.
3. In the pop-up message, click OK.
4. Log into your Slack workspace.  
   A confirmation message appears to confirm your identity on a workspace.

5. Change the workspace if needed by selecting another workspace using the list in the upper right corner.

6. Click Authorize to authorize the installation.

7. If the selected workspace has already been assigned to Virtual Agent, you are asked to confirm whether you want to proceed to override the previous assignment. Click Override to change the workspace, or Cancel to leave the current assignment in place.
8. A confirmation message appears confirming the installation once it completes. After you see this confirmation, verify the installation. The Slack workspace appears below the Slack heading on the Integration page.

Configure Virtual Agent messaging for messaging apps

Modify messages in the adapter configuration pages for third-party apps to customize the text users see in Virtual Agent conversations.

Role required: admin or virtual_agent_admin

1. Navigate to Collaboration Virtual Agent Messaging Apps Integration.
2. In the Slack or Microsoft Teams section, click the down arrow to show a list of installed teams.

Notify your users that the Virtual Agent bot for Slack is available for use. Your users can then link their ServiceNow account to the Slack account to access non-public Virtual Agent topics (that use ServiceNow records). For details on these steps, see Link your ServiceNow user account to a messaging application for Virtual Agent conversations on page 3080.
3. Click the name of one of the teams to go to the configuration page. The Adapter Configurations list shows a list of keywords, labels, and messages and the default values for each.

4. Double-click an attribute value to change that value.

   **Note:** For Slack integrations only, you can change the bot name and avatar in the Adapter Configuration page. The maximum bot name length is 80 characters.

5. Press Enter or click the green check icon to save your changes.

Link your ServiceNow user account to a messaging application for Virtual Agent conversations

Link your ServiceNow account to a third-party messaging application to access non-public Virtual Agent topics that use ServiceNow records.

Role required: user

1. Open the messaging application.
2. Find your Virtual Agent bot.
3. Start a conversation with your Virtual Agent bot. The bot then presents a link to authenticate.

   ![Figure 658: Example authentication message](image)

4. Click the Connect to ServiceNow link to authenticate. Authentication directs you to your instance. If you are not already logged in to your instance, you are prompted to enter your login credentials.

5. A confirmation message appears, prompting you to Confirm or Deny linkage between your accounts. Click Confirm to allow the account link.
Note: For security reasons, the confirmation prompt expires after five minutes. If you do not respond within five minutes, or if your account is not valid, the account linking process fails. Restart the linking process by typing Hi again to display the authentication link.

6. After confirmation, you are directed to the instance user record. A confirmation message is displayed at the top of the screen.

7. Return to your messaging app and continue your conversation with the Virtual Agent bot.

Unlink your ServiceNow user account from a messaging application for Virtual Agent conversations

If needed, you can unlink your ServiceNow user account from a messaging app used for the Now Virtual Agent.

Role required: user

Unlinking your account from a selected messaging app, such as Slack or MS Teams, deactivates the association between your ServiceNow account and the messaging app. After you unlink your account, you can no longer engage in Virtual Agent conversations that query or change records in the ServiceNow database. But you can still run public Virtual Agent conversations.

1. Navigate to Self-Service My Profile.
2. Click the View Linked Accounts related link.
3. In the Linked Accounts page, check the selection box for the messaging integration to be unlinked.
4. Select Actions on selected rows..., then click Unlink account.
   The link between your ServiceNow account and the Virtual Agent messaging integration becomes inactive.

---

**Note:** Even though you unlinked your account, you can still run public Virtual Agent conversations. To link your account again, repeat Steps 1 through 3 for the associated messaging integration and in the Actions on selected rows..., click Link account.

---

**Configure Virtual Agent branding**

Customize the Virtual Agent bot with your own company logo and avatar. Set the color schemes of the UI elements and customer support contact information displayed in the web-based conversational interface.

*Role required: admin or virtual_agent_admin*

To prepare for configuration of the conversational interface, gather the following information.

- Your company logo and avatar for your virtual agent bot. The images must be a .jpg, .png, .bmp, .gif, .jpeg, .ico, or .svg file format. The images can be high resolution, but the image display is scaled based on the aspect ratio.
- The brand color hex or RGB numbers for your company, typically from your marketing department. Use them to configure the colors for UI items, such as font colors and background colors for chat bubbles or buttons displayed.
Figure 659: Chatbot branding and UI elements

- Contact information for your support organization, such as support call hours, call center support phone number, and support email address.
Each color selection option provides a color picker to select a color. The text box beside the color picker lets you enter the value of the color as any of the following CSS formats.

- Name: predefined color names, such as red, green, blue
- RGB decimal: RGB(102, 153, 204)
- RGB hex: #223344

For information about HTML color names, see [HTML Color Names (W3CSchools)](https://www.w3schools.com/cssref/css_colors.asp).

2. Change any of the branding settings to customize the chatbot and chat interface:

<table>
<thead>
<tr>
<th>Label</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logo in Chat Header [com.glide.cs.branding.va_logo]</td>
<td>Click + next to the ServiceNow logo and upload your logo.</td>
</tr>
<tr>
<td>Label</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Modify the bot avatar</td>
<td>Click bot user profile to change the bot avatar. In the Live Profile form:</td>
</tr>
<tr>
<td>[com.glide.cs.branding.va_profile]</td>
<td>• To upload an avatar image, locate the Photo field, click Update, and choose the image file and click OK. Enter a short description of the avatar in the Live Profile form and click Update.</td>
</tr>
<tr>
<td></td>
<td>• To delete an avatar, locate the Photo field and click Delete.</td>
</tr>
<tr>
<td>Virtual Agent Profile — Live Profile Reference</td>
<td>The reference ID of the bot. Do not change this value.</td>
</tr>
<tr>
<td>[com.glide.cs.branding.va_profile]</td>
<td></td>
</tr>
<tr>
<td>Chat Header</td>
<td>The text string that identifies your company or organization in the chat window. For example: Acme Support</td>
</tr>
<tr>
<td>[com.glide.cs.branding.header_label]</td>
<td></td>
</tr>
<tr>
<td>Chat Header Background</td>
<td>The background color of the chat header.</td>
</tr>
<tr>
<td>[glide.sycom.glide.cs.branding.header_bg_color]</td>
<td></td>
</tr>
<tr>
<td>Chat Header Font</td>
<td>The font color of text in the chat header.</td>
</tr>
<tr>
<td>[com.glide.cs.branding.header_font_color]</td>
<td></td>
</tr>
<tr>
<td>Chat Background</td>
<td>The background color of the chat window.</td>
</tr>
<tr>
<td>[com.glide.cs.branding.bg_color]</td>
<td></td>
</tr>
<tr>
<td>User Bubble Background</td>
<td>The background color of the user chat bubble.</td>
</tr>
<tr>
<td>com.glide.cs.branding.bubble_bg_color</td>
<td></td>
</tr>
<tr>
<td>User Bubble Font</td>
<td>The font color of text in the user chat bubble.</td>
</tr>
<tr>
<td>[com.glide.cs.branding.bubble_font_color]</td>
<td></td>
</tr>
<tr>
<td>Category Background</td>
<td>The background color of the heading above a list of topics.</td>
</tr>
<tr>
<td>[com.glide.cs.branding.category_bg_color]</td>
<td></td>
</tr>
<tr>
<td>Category Font</td>
<td>The font color of text in the category heading.</td>
</tr>
<tr>
<td>[com.glide.cs.branding.category_font_color]</td>
<td></td>
</tr>
<tr>
<td>Bot Bubble Background</td>
<td>The background color of the bot chat bubble.</td>
</tr>
<tr>
<td>[com.glide.cs.branding.bubble_bg_color]</td>
<td></td>
</tr>
<tr>
<td>Bot Bubble Font</td>
<td>The font color of text in the bot chat bubble.</td>
</tr>
<tr>
<td>[com.glide.cs.branding.bubble_font_color]</td>
<td></td>
</tr>
<tr>
<td>Agent Bubble Background</td>
<td>The background color of the live agent chat bubble.</td>
</tr>
<tr>
<td>[com.glide.cs.branding.agent_bubble_bg_color]</td>
<td></td>
</tr>
<tr>
<td>Label</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Agent Bubble Font</td>
<td>The font color of text in the live agent chat bubble.</td>
</tr>
<tr>
<td>[com.glide.cs.branding.agent_bubble_font_color]</td>
<td></td>
</tr>
<tr>
<td>Input Background</td>
<td>The background color of the user input bar.</td>
</tr>
<tr>
<td>[com.glide.cs.branding.input_header_color]</td>
<td></td>
</tr>
<tr>
<td>Button Background</td>
<td>The background color of buttons used in the conversation</td>
</tr>
<tr>
<td>[com.glide.cs.branding.button_bg_color]</td>
<td></td>
</tr>
<tr>
<td>Link</td>
<td>The color of links presented in the conversation.</td>
</tr>
<tr>
<td>[com.glide.cs.branding.link_color]</td>
<td></td>
</tr>
<tr>
<td>Disabled Link</td>
<td>The color of disabled links presented in the conversation.</td>
</tr>
<tr>
<td>[com.glide.cs.branding.disabled_link_color]</td>
<td></td>
</tr>
<tr>
<td>Menu Icon</td>
<td>The color of the menu icon in the web client interface, which provides user options for options to end a conversation or contact customer support.</td>
</tr>
<tr>
<td>[com.glide.cs.branding.menu_icon_color]</td>
<td></td>
</tr>
<tr>
<td>Timestamp</td>
<td>The color of the timestamp displayed when significant activity occurs during a conversation, such as a record being created.</td>
</tr>
<tr>
<td>[com.glide.cs.branding.timestamp_color]</td>
<td></td>
</tr>
<tr>
<td>System Message</td>
<td>The color of general system messages displayed in the conversation. Define these system messages in <em>General Settings</em> for Virtual Agent conversations.</td>
</tr>
<tr>
<td>[com.glide.cs.branding.system_message_color]</td>
<td></td>
</tr>
<tr>
<td>Load Animation</td>
<td>The color of the animated dots that indicate the system is processing information.</td>
</tr>
<tr>
<td>[com.glide.cs.branding.load_animation_color]</td>
<td></td>
</tr>
<tr>
<td>Separator</td>
<td>The color of the dashed line that separates each conversation in the Preview window.</td>
</tr>
<tr>
<td>[com.glide.cs.branding.separator_color]</td>
<td></td>
</tr>
</tbody>
</table>

3. Enter the contact information for your support center:

**Table 1220: Agent contact properties**

<table>
<thead>
<tr>
<th>Label</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Call</td>
<td>Informative text string. For example, a text string that indicates when phone support is available: Call Support (Daily 5 AM to 11 PM)</td>
</tr>
<tr>
<td>[com.glide.cs.branding.support_phone_label]</td>
<td>Leave this value blank to hide the email support option.</td>
</tr>
<tr>
<td>Phone Number</td>
<td>The phone number of your call support organization. The phone number must be a valid number.</td>
</tr>
<tr>
<td>[com.glide.cs.branding.support_phone]</td>
<td></td>
</tr>
</tbody>
</table>
Configure Virtual Agent conversation settings

Use the Virtual Agent general settings to define the basic characteristics of a bot conversation, such as the welcome message and generic error message displayed.

Role required: admin or virtual_agent_admin

Note: If you are using the Virtual Agent messaging integrations, you can also customize messages shown in Slack or Microsoft Teams through the integration configuration pages. For details, see Configure Virtual Agent messaging for messaging apps on page 3079.

1. Navigate to Collaboration Virtual Agent General Settings.
2. Change any of the following bot conversation settings:

<table>
<thead>
<tr>
<th>Label</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welcome message</td>
<td>The text string for the default conversation greeting.</td>
</tr>
<tr>
<td>[com.glide.cs.general.welcome_message]</td>
<td></td>
</tr>
<tr>
<td>Top selection message</td>
<td>The text string that specifies the next selection that the user can make in the conversation.</td>
</tr>
<tr>
<td>[com.glide.cs.general.top_selection_message]</td>
<td></td>
</tr>
<tr>
<td>Generic error message</td>
<td>The text string displayed when an irrecoverable error occurs during a bot conversation.</td>
</tr>
<tr>
<td>[com.glide.cs.general.error_message]</td>
<td></td>
</tr>
<tr>
<td>Minimum delay before displaying typing animation</td>
<td>The delay, in milliseconds (ms), that occurs before showing the animation ellipsis indicating the bot is processing user input.</td>
</tr>
<tr>
<td>[com.glide.cs.general.type_presence_delay]</td>
<td></td>
</tr>
<tr>
<td>Minimum delay between bot messages</td>
<td>The minimum delay, in milliseconds (ms), that occurs between bot responses.</td>
</tr>
<tr>
<td>[com.glide.cs.general.msg_delay]</td>
<td></td>
</tr>
</tbody>
</table>
3. Click Save.

Transferring Virtual Agent conversations to a live agent

Use the Live Agent module to manage live chat support, including the chat queues used when a Virtual Agent conversation is transferred to a live agent.

In new and upgraded instances, the Live Agent plugin (com.glide.cs) is activated by default. This plugin includes related plugins for chat support, such as Connect Support (com.glide.connect.support), which is the default fulfiller user interface.

When bot conversations are transferred to a live agent

Conversations in Virtual Agent are transferred to a live agent in several ways. This transfer happens automatically when an unrecoverable error occurs, but it can also be triggered via a script in a topic, or when manually selected by the user.

**Automatic transfer to a live agent when an error occurs**

When a conversation encounters an error, the conversation automatically transfers to a live agent.

- An unrecoverable error has occurred.
- Please stand by while I connect you to a live agent.
- Routing you to a live agent...

**Note:** If you do not intend to use Live Agent, make sure to remove references to queues in live agent setup, or deactivate your Live Agent queue [chat_queue] records. For details on chat queue setup for Virtual Agent, see Specify Live Agent chat queues on page 3091.

**Automatic transfer to a live agent triggered by a script in a topic**

In situations where you want a support agent to handle the conversation, you can create a script in your topic that uses the vaSystem.connectToAgent() command. This command triggers a transfer to a live agent. This option can be useful for conversations involving negative customer sentiment, high priority requests, or requests outside the scope of your topic process. For example:

```javascript
(function execute() {
```

© 2018 ServiceNow. All rights reserved. 3088
if (vaInputs.urgency == 1 &&
    vaInputs.impact == 3)
    vaSystem.connectToAgent();

This script action control transfers the conversation to a live agent based on the incident impact and urgency indicated by the user.

In the Virtual Agent web-based client, users can choose the Contact Support option to transfer to a live agent.

**Note:** Users running a Virtual Agent messaging integration must type the keyword Hi to access the live agent transfer option. For details, see *Virtual Agent integration with messaging applications* on page 3072.

Next, they select the Contact Live Agent option to transfer the conversation to the live agent.
How bot conversation transfers work

For a user engaged in a bot conversation, the switch to a live agent is a seamless transfer. When a transfer is triggered, either automatically or manually by the user, the conversation is automatically routed to the appropriate chat support queue in Connect Support. For the user, the conversation with the agent continues in the Virtual Agent (client) interface. In Connect Support, the agent accepts the queue with the transferred user to join the conversation and interact with the user.
In Live Agent setup, admins assign the default chat queues (for Customer Service Management, HR Service Delivery, and IT Service Management) or a global queue to which Virtual Agent conversations are automatically routed if default queues are not assigned. These queues, which you define in Connect Support, are stored in the Chat Queues [chat_queue] table.

In Live Agent setup, admins also define the general messages that users see during live agent transfers.

Specify Live Agent chat queues

Specify the Live Agent chat queues used for chat support and the general support messages displayed during a transfer from a bot conversation to a live agent.

Role required: admin or virtual_agent_admin

Define the chat queues using Connect Support. For details, see Administer Connect Support queues on page 510 and Make a Connect Support queue accessible to end users on page 511.
If you are using Virtual Agent, the Virtual Agent Context related list displays below the Live Agent Settings. Use this list to specify the Live Agent variables that can be used in Virtual Agent topic scripts. Use Live Agent variables to pass certain information from the topic to share with the live agent or control how bot conversations are routed to live agents. For details on using Live Agent variables, see Virtual Agent scripts on page 3154.

**Note:** All contexts are accessible via script, but only the queue context can be modified by a script.

1. Navigate to Collaboration Live Agent Setup.
2. Complete the Live Agent Setup form.

### Table 1221:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The live agent setup configuration.</td>
</tr>
<tr>
<td>CSM Queue</td>
<td>The live agent chat queue used for Customer Service Management if not specified through the chat interface or changed by a topic.</td>
</tr>
<tr>
<td>CSM Fulfiller UI</td>
<td>The chat support interface used. The default is Connect Support.</td>
</tr>
<tr>
<td>HR Queue</td>
<td>The live agent chat queue to be used for Human Resources if not specified through the chat interface or changed by a topic.</td>
</tr>
<tr>
<td>HR Fulfiller UI</td>
<td>The chat support interface for HR. The default is Connect Support.</td>
</tr>
<tr>
<td>ITSM Queue</td>
<td>The live agent chat support queue used for IT Service Management if not specified through the chat interface or specified by a topic.</td>
</tr>
<tr>
<td>ITSM Fulfiller UI</td>
<td>The chat support interface for ITSM. The default is Connect Support.</td>
</tr>
<tr>
<td>Global Queue</td>
<td>The queue used if the Virtual Agent does not have context to the queue through the chat interface or topic.</td>
</tr>
<tr>
<td>Global Fulfiller UI</td>
<td>The chat support interface for the platform. The default is Connect Support.</td>
</tr>
<tr>
<td>Transfer Message</td>
<td>The message that users see when they are transferred to a live agent or another queue. For example: &quot;Please stand by while I connect you to a live agent.&quot;</td>
</tr>
</tbody>
</table>

**Note:** You can define only one transfer message, which is displayed for all the queues in your instance.
### Field

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Agents Available Message</td>
</tr>
<tr>
<td>Message that users see when a live agent is not available. For example: “There are no agents available at the moment. Please try again later.”</td>
</tr>
</tbody>
</table>

**Note:** You can define only one agent availability message, which is displayed for all the queues in your instance.

3. Click Update.

### Virtual Agent Designer

The Virtual Agent Designer is a graphical tool for creating and managing topics, which are blueprints for conversations between a virtual agent and user. You can design topics that help your users resolve common work issues or guide them through self-service tasks.

### Topic development process

Topic development by an admin or virtual_agent_admin involves these basic steps:

**Identify the use case for an automated conversation**

Determine the use case or goal of your topic, for example solving a user problem or assisting with a self-service task, and the users of that topic.

As you gather key requirements for your topic, identify the information that you need from the user to complete the goal.

**Determine the general structure of the conversation**

Identify the conversation "happy" path, and the alternate paths where the conversation might branch depending on the information supplied by the user. Consider how to handle each branch and whether users loop back to an earlier point in the conversation.

**Build the topic using Virtual Agent Designer**

Follow these steps:

1. **Define the topic properties.**
   - Name the topic and set the keywords for triggering the conversation. You can also specify a condition for running the topic and the roles of users who can run that topic.

2. **Build the conversation flow.**
   - Use the palette of user inputs, bot responses, and utilities to create the conversation flow.
3. **Preview the topic as you build it.** Use the Preview feature to run the topic in its current state.

4. **Publish the topic.** Publishing the topic automatically activates the topic and deploys it to the Virtual Agent client.

---

**Managing topics**

Use the Topics page to manage your topics. You can search, sort, create, and run active topics through this page. The Topics page lists the active (published) and inactive topics (in development) in your instance.

- **Run Active Topics** — Opens a window for running topics in the Virtual Agent web client. Use this feature to test your keywords and verify that your published topics work as intended.
- **Add a Topic** — Opens the Topic Properties page to start the topic creation process and define the topic-level properties. For details, see *Create a Virtual Agent topic* on page 3105.
Defining topic properties

Topic properties identify a topic and how it is accessed, including who can use the topic and any conditions that affect when it is run. These properties include:

**Keywords**

Keywords are words or phrases that users enter to trigger a particular conversation in the client interface.

**Condition**

A JavaScript script that defines the condition for running the topic. The script returns a value of true or false. A returned value of false means that the topic does not appear in the client. If the return value is false, the control is not used.

**Roles**

The roles of users required to run the topic. Assigning the public role to a topic makes the
topic a public topic. Public topics are accessible to unauthenticated users, such as guest users.

**Live Agent variables**

Live Agent variables available to the topic. The selected variables are accessible scripts within the topic to provide dynamic information when transferring a virtual agent conversation to a live agent.

**Topic building with the Virtual Agent Designer page**

Use the Virtual Agent Designer page to build a topic flow using the controls for user inputs, bot responses, and utilities.
1. Palette region

List of controls that you can drag onto the canvas to build a conversation:
- **User Input** — controls used to prompt and capture information from the user in a conversation.
- **Bot Response** — controls for displaying bot responses in a conversation.
- **Utilities** — controls for performing actions within a topic, such as running a script or adding different conversation paths (branches) in a topic.

2. Canvas

Area that graphically displays the conversation flow. As you drag a control onto the canvas, that control becomes a node in the conversation flow.
Includes an associated property sheet that opens in the right pane. Each flow has a Start and End node. The layout of controls on the canvas is organized automatically as controls are added and removed.

3. Property sheet
Properties specific to the selected node on the canvas. Each node has its own set of properties that you can define, which can include scripts that control the behavior or processing performed in the node.

4. Script editor
A script editor for adding or editing JavaScript scripts used in a property. Provides scripting assistance, including a list of valid elements at the insertion point, such as function name, object names, and variable names available for the topic. For more information, see the Syntax editor.

5. Script variables
Section for declaring variables used within the topic (conversation session) to store values outside the control variables, to help with more complex scripting scenarios.

Virtual Agent controls
A Virtual Agent topic consists of a collection of controls within a topic flow. Use these controls to collect, process, and present information to your users. Controls can also read, create, and update records on your instance.

Control types
Controls are separated into categories based on their use.

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bot Response</td>
<td>Bot responses provide controls for displaying bot responses in a conversation.</td>
</tr>
<tr>
<td>Start Segment</td>
<td>This control appears automatically in a topic flow and cannot be added or removed from a conversation. This control can be configured with a greeting response that appears when a conversation begins.</td>
</tr>
<tr>
<td>End Segment</td>
<td>This control appears automatically in a topic flow and cannot be added or removed from a conversation. This control can be configured with a final confirmation message before the end of a conversation. Ensure that all branches of your topic eventually connect to this control</td>
</tr>
<tr>
<td>User Input</td>
<td>User inputs provide controls used to prompt and capture information from the user in a conversation.</td>
</tr>
<tr>
<td>Category</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
</tr>
<tr>
<td>Utilities</td>
<td>Utilities provide controls used to control actions and logic within a topic, such as running a script or adding different conversation paths (branches) in a topic.</td>
</tr>
</tbody>
</table>

**Condition property**

All controls, except the Decision utility and the Start and End nodes, have a condition property. Use this property to determine whether that control is used in a conversation. A condition property, if used, contains a script that returns a value of true or false. If the return value is false, the control is not used, and the conversation will continue to the next control along that branch of the topic. A control with a blank condition field is always used. Use conditions to make your conversations more dynamic based on context, data, or scripted logic.

In the preceding example, a condition script returns a value of true if the current user is able to create incident records. This condition prevents a utilities control from creating an incident when the user does not have permission to do so.

**Condition**

```javascript
1 (function execute() {
2 var gr = new GlideRecord('incident');
3 return gr.canCreate();
4 })()```

Designing a Virtual Agent topic

Walk through the design of an example topic that enables users to view incidents they submitted. This example highlights various design controls that can be used to build the conversation flow.

**Plan the structure of a conversation**

The first step in implementing a topic is to decide what the topic covers. Consider the intended audience, and what you want the audience to accomplish when using the conversation. For this example, the goal of this topic is to create a flow that enables end users to see the status of incidents they submitted. The topic includes an option for the user to add a comment to the incident.

With this goal in mind, the topic needs the following elements:

- A prompt for the user to select an incident.
- An output showing the status of the incident.
- A prompt to ask if the user wants to leave a comment.
- A utility control to branch the conversation on that answer.
• A prompt for the user to enter a comment.
• A utility control to add the user input as a comment in the incident.

**Build the conversation flow with Virtual Agent controls**

The conversation is going to look similar to the following dialog flow.

---

**Important:** This flow is intended to give you an idea of how the completed flow looks. It is not recommended that you build the entire layout first. Build your topic incrementally, and test your topic frequently. Make sure to consider both functionality and user experience in your testing.

---
Configure controls within the conversation

This example begins with defining the conversation flow in Virtual Agent Designer, after the topic properties have been set. The conversation begins with a Start node and finishes with an End node.

1. In Virtual Agent Designer, add a Reference Choice control to the conversation flow. This control is used to select the incident.
   a. Enter Choose an incident for the Name property. The variable name choose_an_incident is automatically generated for the control.
   b. In the Prompt property, enter the text the user sees before selecting an incident.
   c. In the Acknowledge Message property, enter text the user will see after making a selection. This value can be a static string, for example, Thank you for making a selection. This value can also be a scripted message, as shown here:

      ```javascript
      (function execute() {
        return "Thanks " + gs.getUser().getFirstName() + ", Here's the current status of " + vaInputs.choose_an_incident.number + ",";
      })()
      ```

      In the preceding example, the script uses the first name for the user, and the number of the record entered into this prompt.
   d. Leave the Default Value property blank.
   e. In the Reference Type property, select Record.
   f. In the Table property, select incident.
   g. In the Choice Value Expression property, input the following code:

      ```javascript
      (function execute(table) {
        var options = [];
        var gr = new GlideRecord(table);
        gr.addQuery('active', true);
        gr.addQuery('opened_by', gs.getUser().getID());
        gr.setLimit(10);
        gr.orderByDesc('opened_at');
        gr.query();
        while(gr.next()) {
          options.push({ 'value': gr.getUniqueValue(), 'label': gr.getValue('number') + ' - ' + gr.getValue('short_description') });
        }
        return options;
      })(table)
      ```

      This script queries the incident table for active records opened by the current user, places these records into an array, and returns that array. The script also sets a limit of 10 records, and orders them by the date they were opened. As a result, the user has a choice from the 10 most recent active incidents they have opened.

2. Add a Card control to the flow. This control shows information from the record selected by the Reference Choice in the previous step.
   a. Enter Status Card for the Name property.
   b. In the Reference Type property, select Record.
   c. In the Record property, select Choose an Incident. This choice refers to the Reference Choice control created in the previous step, so the data displayed comes from the record chosen there.
d. In the Fields control, select a field. The choices available are the available fields on the chosen record. In this case, you can see the fields on the incident table. After a field has been selected, click the Add Field option to add additional fields to the card. A delete icon appears to the right of each selected field. Clicking these icons removes the field from the card.

3. Add a Boolean control to the flow. This control is used to prompt the customer with a yes/no question. In this case, the control checks to see if the user wants to leave a comment on the selected incident record.
   a. Enter Leave Comment? for the Name property. The variable name leave_comment_ is automatically generated for the control.
   b. In the Prompt property, enter the text the user sees before the prompt. In this case, ask the user whether they want to leave a comment on the incident.
   c. Optionally, you can enter a value in the Acknowledge Message property. This value appears after the user chooses yes or no.

4. Add a Decision control to the flow. This control branches the conversation into two possible paths. The path the conversation follows depends on the choice the user made in the previous step.
   a. There are no properties on the decision control, however there are properties on the branches below the decision. By default, there is a single branch labeled Always. Click the blue plus icon at the bottom of the decision control. A second branch appears labeled Never.
   b. Click the Always branch of the decision to access the properties for this branch.
   c. Change the name to Leave Comment.
   d. In the condition property, enter the following code.
      
      (function execute() {
          return Vars.leave_comment_.getValue() == 'true';
      })()

      If the value of the leave_comment_ variable is true, this script returns a value of true. This variable is the variable from the Boolean control in the previous step. If the user chose Yes at the prompt, the conversation follows this branch.
   e. Click the Never branch of the decision to access the properties for this branch.
   f. Change the name to No Comment.
   g. In the condition property, enter the following code.
      
      (function execute() {
          return Vars.leave_comment_.getValue() == 'false';
      })()

      If the value of the leave_comment_ variable is false, this script returns a value of false. This variable is the variable from the Boolean control in the previous step. If the user chose No at the prompt, the conversation follows this branch.
   h. One of the two branches you have created points to the End node of the conversation. The second branch should also lead to this node. Click the arrow at the bottom of that branch, and drag it the End node.

5. Add a Text Input control to the Leave Comment branch of the conversation. This control is used to request text input from the user.
   a. Enter Get Comment for the Name property. The variable name get_comment is automatically generated for the control.
b. In the Prompt property, enter the text the user sees before the prompt. In this case, ask the user for the text of the comment.

c. Optionally, you can enter a value in the Acknowledge Message property. This value appears after the user enters a comment.

6. Add an Action control to the conversation below the Get Comment control. This control is used to add the text entered into the previous control as a comment on the selected incident.

a. Enter Save Comment to Incident for the Name property.

b. In the Action Type property, select Update a Record.

c. In the Record property, select Choose an Incident. This choice refers to the Reference Choice control created in the previous step, so the record chosen there is the one that this Action control updates.

d. In the Field property, click Add Field. A pop-up window appears. Fields from the record can be selected and given values in this window.

e. Select the Additional Comments field from the list.
f. Click the button to the right of the field to select a value from one of the controls in this conversation.

g. Click the Get Comment option from the list. This option refers to the value entered by the user in the Text Input control from the previous steps.

h. Click the Save button at the bottom of the pop-up window.

Test the conversation

Use the Preview button to test the flow of the conversation. Preview topics often throughout the design process to find errors or unexpected behavior quickly. For further information on debugging topics, see Debug a Virtual Agent topic on page 3108.

Create a Virtual Agent topic

Use Virtual Agent Designer to create and modify chatbot topics (conversations). Build your topic to meet a specific objective or goal, such as fulfilling a user's request or helping a user complete a task.

Role required: virtual_agent_admin or admin

Topic authors should have a basic knowledge of the ServiceNow platform and application table structures, scripting (JavaScript), HTML, and REST integrations.

Define the flow of user inputs, bot responses, and actions performed in a chatbot conversation. The main steps in topic creation are:

- Define the topic-level properties.
- Build the topic flow with user inputs, bot responses, and utilities. For each control, specify the properties that determine how the control functions in the conversation. Save the topic frequently as you build the flow.
- Preview and test the topic as you build it.
- Save the topic flow.

**Note:** When you create a topic, the topic is in the inactive state until you publish it. Publishing a topic changes the topic state to active and automatically deploys the topic to your Virtual Agent clients.

1. Navigate to Collaboration Virtual Agent Designer, and in the Topics page, click + Add a topic.
   The Topic Properties page displays.
2. Enter the topic properties.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>A unique name for the topic that reflects its business purpose.</td>
</tr>
<tr>
<td>Description</td>
<td>A brief description of the topic.</td>
</tr>
<tr>
<td>Keywords</td>
<td>A list of key phrases or terms that users enter to initiate the conversation with the chatbot. Press Enter after each phrase.</td>
</tr>
</tbody>
</table>
### Field | Description
--- | ---
Condition | Expression logic that uses one or more conditions to control who sees a topic in the Virtual Agent client. If left blank, the expression is true.
Roles | The roles that an end user must have to view and run the topic. If a topic is public (available to users, including guest users, who are not authenticated in ServiceNow), select only the Public role.
Live Agent variables | The Live Agent variables defined in Live Agent setup. Select the variables that provide dynamic context (information from the Virtual Agent chat) transferred from the topic to a Live Agent.

3. Click Save.
4. Click Edit Topic flow.
   The Virtual Agent Designer page opens.
5. To add a user input, bot response, or utility:
   a) Drag the input, bot response, or utility control from the Designer palette and drop it in the canvas. The item becomes a node in the conversation flow.
   b) Complete the properties for the node. For details on each control and the corresponding properties that you define, see User inputs, Bot responses, and Utilities.
   c) Click Save.
   d) To see how the topic runs in the Preview window, click Preview.
      To see details on how each node in the flow is processed, click Show Log in the Preview window. For more information on using the Preview logs, see Debug a Virtual Agent topic on page 3108.
   e) Repeat adding the various controls, previewing, and saving until the conversation flow is complete.

To move a node, click the node and then drag it to the new location and click Save.
6. To delete a user input, bot response, or utility:
   a) Click the X in the upper right corner of the node.
   b) Confirm that you want to delete the node.
   c) Click Save.

**Note:** You cannot delete a node that has a script variable used by subsequent JavaScript expressions in the flow. Also, a decision node can be deleted only when it has one leaf branch.

**Publish** the topic to deploy it to your Virtual Agent clients.

### Publish a Virtual Agent topic

Deploy an inactive topic to the Virtual Agent client.

Role required: admin or virtual_agent_admin

1. Navigate to Collaboration Designer.
2. In the Topics page, select the inactive topic to be published.
3. In the Topic Properties page for the topic, click Publish. 
   The topic state changes to Active.
4. Verify that your keywords for the topic work as expected.
   a) Return to the Topics page and click Run Active Topics.
   b) In the conversation window, test each topic keyword to verify that the corresponding conversation
      opens.
      For example, in the predefined Virtual Agent topics, the bot returns a list of topics that might
      match the keyword entered.

**Duplicate a Virtual Agent topic**

You can copy an existing Virtual Agent topic and edit it to create a new topic.

Role required: virtual_agent_admin or admin

Consider duplicating topics when you want to:

- Use an existing topic, such as a predefined topic, as the basis for a new topic.
- Modify an active topic but want to preserve the original topic for reference purposes or as a backup.

1. Navigate to Collaboration Virtual Agent Designer, and in the Topics page, click the topic to be copied. 
   The Topic Properties page is displayed.
2. Change the topic properties as needed.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>A unique name for the new topic.</td>
</tr>
<tr>
<td>Description</td>
<td>A brief description of the topic.</td>
</tr>
<tr>
<td>Keywords</td>
<td>A list of key phrases or terms that users enter to initiate the conversation with the chatbot.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> You may need to change certain keywords depending on the goal or purpose of your new topic.</td>
</tr>
<tr>
<td>Condition</td>
<td>A script that defines the conditions that must be met for running this topic. The regular expression must evaluate to true.</td>
</tr>
<tr>
<td>Roles</td>
<td>The roles that an end user must have to view and run the topic. Select the available roles from the Roles list.</td>
</tr>
<tr>
<td>Live Agent variables</td>
<td>The Live Agent variables defined in Live Agent setup. Select the variables that provide dynamic context (information from the Virtual Agent chat) transferred to a Live Agent.</td>
</tr>
</tbody>
</table>

3. Click Save.
4. Click Edit Topic flow.
   The Virtual Agent Designer canvas is displayed.
5. To add a user input, bot response, or utility:
a) Complete the properties for the node. For details on each control and the corresponding properties that you define, see User inputs, Bot responses, and Utilities.
b) Click Save.
c) To review the topic in the Preview window, click Preview.
   To see details on how each node in the flow is processed, click Show Log in the Preview window. For more information on using the Preview logs, see Debug a Virtual Agent topic on page 3108.
d) Repeat adding the various controls, previewing, and saving until the conversation flow is complete.

6. To delete a user input, bot response, or utility:
   a) Click the X in the upper right corner of the node.
   b) Confirm that you want to delete the node.
   c) Click Save.

Note: You cannot delete a node that has a variable used by subsequent JavaScript expressions in the flow. A decision node can be deleted only when it has one leaf branch.

Publish the topic to deploy it to your Virtual Agent clients.

Delete a Virtual Agent topic

Delete a Virtual Agent topic that is no longer needed.
Role required: admin or virtual_agent_admin
If you want to remove a topic from your Virtual Agent clients but do not want to delete it, consider making the topic inactive instead.

1. If necessary, navigate to Collaboration Virtual Agent Designer to display the Topics page.
2. Select the topic to open the Topic Property page and click Delete.
   The topic is immediately removed from Virtual Agent clients and is no longer listed on the Topics page.

Debug a Virtual Agent topic

Use the following information to investigate and resolve unexpected behavior in your custom Virtual Agent topics.

Duplicate topics when possible

Duplicate a topic to make changes rather than updating a live topic. The unmodified original topic can serve as both a reference and a backup, and allow you to quickly restore the topic. Remember to de-activate the original topic before publishing the duplicate.

Preview your conversations often

Use the Preview button to test a conversation. The preview pop-up shows the conversation as it appears within Service Portal. Elements in your conversation may appear differently in third-party applications such
as Slack and Microsoft Teams. Test your conversations in any third-party applications where you intend to deploy Virtual Agent.

Use the conversation preview logs to view errors and messages logged while previewing a topic. Use the following steps to access the conversation preview logs. Use gs.log, gs.print, and gs.warn statements in your scripts to output information in this log.

1. In Virtual Agent Designer, click Preview to begin previewing a topic.
2. In the topic preview window, click the Show Logs check box.

**Note:** Logging information does not begin to appear in the logs until after the Show Logs check box is selected. Select this option immediately after the topic preview loads to ensure that all logging information is available.
Watch for warnings on controls within your topic

Controls that are missing necessary information show a red icon in the upper left corner of the control. The icon shows a number indicating the number of issues in that control. Point to this icon to see a list of the issues in the control.

Another icon appears in the upper left corner of the designer to indicate the number of issues within the entire topic.

Check for errors when a topic preview does not run
Additional information appears under the Virtual Agent Designer canvas when an error prevents the topic from running. Use the information provided to correct any errors in your conversation.

**Common issues**

<table>
<thead>
<tr>
<th>Issue</th>
<th>Possible resolution</th>
</tr>
</thead>
</table>
| Cannot see module designer under collaboration| • User may not have the virtual_agent_admin role.  
• Virtual Agent plugin may not be activated.                                                                                                      |
| Cannot edit a topic                           | Logged in user must be in the same application scope as topic.                                                                                     |
| Cannot preview topic                         | • Fill in all required fields on the node properties.  
• Your web browser may be configured to block pop-ups. Ensure that your browser is configured to permit pop-ups from your instance. |
| Web client stuck at Connecting....           | • One or more of your topics may be missing. Check the Topics page to ensure that topics are present on the instance and in the active state.  
• Chat workers may be down. Run the following code in Scripts - Background to restart them.  
```javascript
var gw = GlideWorkerThreadManager.get();
gw.init("com.glide.cs.qlue.module.worker.Worker");
``` |
| No response from bot                         | The AMB workers on your instance may be down. Restart AMB workers.                                                                                 |

**Virtual Agent Designer user inputs**

Virtual Agent Designer provides a collection of input controls that can be used to prompt and capture information from the user in a conversation.

**Common input properties**

Each input control has the following common properties:

**Variable for the user response**

Each control stores the user response in a variable that is accessible from other controls within the same topic using the getValue() and...
getDisplayValue() methods. The variable name is based on the name that you assign to the input control. For example, if you assign the name First prompt to an input control, the variable name is first_prompt (lower case, with an underscore character instead of a space). For more information on these methods, see Virtual Agent scripts on page 3154.

**Default value**
An input prompt can have a preset value, which you define. This value can be either a string, or a script that returns a string.

**Confirmation message**
If your input control provides users with a single-choice or default value selection, the selection that the user makes is automatically displayed in the conversation. For example, if you present a boolean prompt, the user's selection (either yes or no) is automatically displayed. This message can be either a text string, or a script that returns a text string.

**Condition script**
You can define a script that contains a condition statement that returns true or false. If the condition evaluates to true, the control is used. For example, you can specify a condition that enables only certain users to see a particular input prompt, while hiding the prompt from other users. If no script is used in the condition, the condition always evaluates to true.

**Text user input**
Use Text input in a Virtual Agent topic to prompt the user for a text string.
### Example text input

#### Table 1224:

<table>
<thead>
<tr>
<th>Response properties</th>
<th>Text input prompt</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### User Input Properties

**String Basic Info**

- **Name**: Test Input
- **Variable Name**: test_input
- **Prompt**: Enter some text

**Acknowledge Message**: Thank you!

**Default Value**: 

**Confirmation Message**: 

**Condition**: 

---

**Figure 662: Web UI text input prompt**

- Virtual Agent: 1:56 PM
- Test User: 1:47 PM

**Figure 663: Slack text input prompt**

- Virtual Agent: 10:59 AM
- Test User: 10:59 AM

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Text input properties

Table 1225: Text properties

<table>
<thead>
<tr>
<th>Text property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The name that identifies this text node in the topic flow.</td>
</tr>
<tr>
<td>Variable Name</td>
<td>The name of the variable that stores the user response to this prompt. The variable name is automatically created from the Name property.</td>
</tr>
<tr>
<td>Prompt</td>
<td>The prompt or question to the user. The prompt can be either a text string or a script that returns text.</td>
</tr>
<tr>
<td>Acknowledge Message</td>
<td>The message that verifies the user selection. The message can be either a text string or a script that returns text.</td>
</tr>
<tr>
<td>Default Value</td>
<td>The predefined value for the user response to the question or prompt. The value can be either a text string or a script that returns text.</td>
</tr>
<tr>
<td>Confirmation Message</td>
<td>The message that verifies the default or single-choice selection made by the user. The message can be either a text string or a script that returns text.</td>
</tr>
<tr>
<td>Condition</td>
<td>A script that specifies a condition for presenting this prompt in the conversation. The condition must evaluate to true.</td>
</tr>
</tbody>
</table>

Note: Slack users can edit text previously entered in a conversation. However, Virtual Agent does process messages after they were first entered. If a Slack user edits text input, such as a comment to update a case, Virtual Agent does not evaluate the edited update.

Static Choice List

Use the Static Choice List in a Virtual Agent topic to list predefined choices available to the user. A user can select only one item from a choice list.
Example static choice list

Table 1226:

<table>
<thead>
<tr>
<th>Input properties</th>
<th>Static choice list prompt</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>User Input Properties</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Static Choice List Basic Info</strong></td>
<td></td>
</tr>
<tr>
<td>* Name ①</td>
<td>Test Choice</td>
</tr>
<tr>
<td>* Variable Name ①</td>
<td>test_choice</td>
</tr>
<tr>
<td>* Prompt ①</td>
<td>Choose an option</td>
</tr>
<tr>
<td>Acknowledge Message ①</td>
<td>Thank you for choosing</td>
</tr>
<tr>
<td>Default Value ①</td>
<td></td>
</tr>
<tr>
<td>Confirmation Message ①</td>
<td>Confirmation Message</td>
</tr>
<tr>
<td>Condition ①</td>
<td></td>
</tr>
<tr>
<td><strong>Choice List Setting</strong></td>
<td></td>
</tr>
<tr>
<td>Label ①</td>
<td>Value ①</td>
</tr>
<tr>
<td>Apple</td>
<td>10</td>
</tr>
<tr>
<td>Orange</td>
<td>20</td>
</tr>
<tr>
<td>Pear</td>
<td>30</td>
</tr>
</tbody>
</table>

Figure 665: Web UI static choice prompt

Figure 666: Slack static choice prompt
# Static choice list properties

<table>
<thead>
<tr>
<th>Static choice list property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The name that identifies this static choice list node in the topic flow.</td>
</tr>
<tr>
<td>Variable name</td>
<td>The name of the variable that stores the user response to this prompt. The variable name is automatically created from the Name property.</td>
</tr>
<tr>
<td>Prompt</td>
<td>The prompt or question to the user. The prompt can be either a text string or a script that returns text.</td>
</tr>
<tr>
<td>Acknowledge Message</td>
<td>The message that verifies the user selection. The message can be either a text string or a script that returns text.</td>
</tr>
<tr>
<td>Default value</td>
<td>The predefined value for the user response to the question or prompt. The value can be either a text string or a script that returns text.</td>
</tr>
<tr>
<td>Confirmation Message</td>
<td>The message that verifies the default or single-choice selection made by the user. The message can be either a text string or a script that returns text.</td>
</tr>
<tr>
<td>Condition</td>
<td>A script that specifies a condition for presenting this prompt in the conversation. The condition must evaluate to true.</td>
</tr>
<tr>
<td>Choice List Setting</td>
<td>For each choice, enter a Label and a Value. The Label is the text that appears to the user for that choice. The Value is what is stored in the variable when that choice is selected. The Value is stored as a string.</td>
</tr>
</tbody>
</table>

**Note:** Slack has a limit of 30 characters for choice list labels.

## Reference Choice List

Use reference choice lists in a Virtual Agent topic to dynamically create a list of available choices. Create these choices by querying a table or by using a script to dynamically create them.
# Example reference choice list

## Table 1227:

<table>
<thead>
<tr>
<th>Input properties</th>
<th>Reference choice list prompt</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Input Properties</td>
<td>Reference Choice List Basic Info</td>
</tr>
<tr>
<td>Name</td>
<td>Please select an incident:</td>
</tr>
<tr>
<td>Variable Name</td>
<td>INC0010003 - Test Incident</td>
</tr>
<tr>
<td>pick_an_incident</td>
<td>INC0010004 - Test Incident 2</td>
</tr>
<tr>
<td>Prompt</td>
<td>INC0010005 - Test Incident 3</td>
</tr>
<tr>
<td>Please select an incident:</td>
<td>INC0010006 - Test Incident 4</td>
</tr>
<tr>
<td>Acknowledge Message</td>
<td>INC0010008 - test</td>
</tr>
<tr>
<td>Response on complete</td>
<td>INC0010009 - New incident test!</td>
</tr>
<tr>
<td>Default Value</td>
<td>INC0010010 - Another Test</td>
</tr>
<tr>
<td>Confirmation Message</td>
<td>INC0010011 - FINAL TEST!</td>
</tr>
<tr>
<td>Here’s the records</td>
<td>INC0010012 - Final, Final Test</td>
</tr>
<tr>
<td>Condition</td>
<td>INC0010013 - Did Something</td>
</tr>
</tbody>
</table>

---

**Figure 668: Web UI prompt**

- INC0010003 - Test Incident
- INC0010004 - Test Incident 2
- INC0010005 - Test Incident 3
- INC0010006 - Test Incident 4
- INC0010008 - test
- INC0010009 - New incident test!
- INC0010010 - Another Test
- INC0010011 - FINAL TEST!
## Reference Choice List property sheet

<table>
<thead>
<tr>
<th>Reference choice list property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The name that identifies this reference choice list node in the topic flow.</td>
</tr>
<tr>
<td>Variable name</td>
<td>The name of the variable that stores the user response to this prompt. The variable name is automatically created from the Name property.</td>
</tr>
<tr>
<td>Prompt</td>
<td>The prompt or question to the user. The prompt can be either a text string or a script that returns text.</td>
</tr>
<tr>
<td>Acknowledge Message</td>
<td>The message that verifies the user selection. The message can be either a text string or a script that returns text.</td>
</tr>
<tr>
<td>Default value</td>
<td>The predefined value for the user response to the question or prompt. The value can be either a text string or a script that returns text.</td>
</tr>
<tr>
<td>Confirmation Message</td>
<td>The message that verifies the default or single-choice selection made by the user. The message can be either a text string or a script that returns text.</td>
</tr>
<tr>
<td>Condition</td>
<td>A script that specifies a condition for presenting this prompt in the conversation. The condition must evaluate to true.</td>
</tr>
</tbody>
</table>

### Choice List Setting

<table>
<thead>
<tr>
<th>Reference Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The type of reference variable to be used. Select one of the following options:</td>
</tr>
<tr>
<td></td>
<td>• Record — returns records from the table selected. The values for these options are GlideRecord objects.</td>
</tr>
<tr>
<td></td>
<td>• Script — The expression that returns an array of options.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table</th>
<th>If you selected Record as the Reference Type, select the table to be searched.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choice Value Expression</td>
<td>If you selected Script as the Reference Type, enter a script that defines the enumeration list for the options (choice list) to be displayed. The name value pair is stored as a string object.</td>
</tr>
<tr>
<td>No records response message</td>
<td>The message displayed to the user when the table search does not return any records. The message can be either a text string or a script that returns text.</td>
</tr>
</tbody>
</table>
Example choice value expression

```javascript
(function execute(table) {
    var options = [];
    var gr = new GlideRecord(table);
    gr.addEncodedQuery('active=true');
    gr.setLimit(10);
    gr.query();
    while (gr.next()) {
        options.push({ 'value': gr.getUniqueValue(), 'label':
            gr.getValue('short_description') });
    }
    return options;
})(table)
```

Script in the Choice Value Expression property defines and returns an array of choices. In the preceding example, the script creates an array called options, and adds each record found in a GlideRecord query to this array. Each element in the array is given a value in the value and label keys using data from that GlideRecord. The Table property of the control defines the table used by the script. This example script uses gr.setLimit(10) to limit the number of records returned to 10. Using this method prevents returned records from creating an overly large choice list.

Table 1228:

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>value</td>
<td>The value for the choice. When a user selects a choice from the control, this value is stored in the variable named in the Variable name property.</td>
</tr>
<tr>
<td>label</td>
<td>The label that appears for this choice in the choice list.</td>
</tr>
</tbody>
</table>

Boolean user input

Use the Boolean user input in a Virtual Agent topic to present a Yes/No prompt to the user.
Example Boolean input element

Table 1229:

<table>
<thead>
<tr>
<th>Input properties</th>
<th>Boolean input prompt</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>User Input Properties</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Boolean Basic Info</strong></td>
<td></td>
</tr>
<tr>
<td>• Name ①</td>
<td>Show Logs [now] Now Support</td>
</tr>
<tr>
<td>Boolean Test</td>
<td>just now</td>
</tr>
<tr>
<td>• Variable Name ①</td>
<td>Choose a response</td>
</tr>
<tr>
<td>boolean_test</td>
<td>Yes</td>
</tr>
<tr>
<td>• Prompt ①</td>
<td>No</td>
</tr>
<tr>
<td>Choose a response</td>
<td></td>
</tr>
<tr>
<td>Acknowledge Message ①</td>
<td>virtualagent 2:18 PM</td>
</tr>
<tr>
<td>Thank you</td>
<td>Choose a response</td>
</tr>
<tr>
<td>Default Value ①</td>
<td>Yes</td>
</tr>
<tr>
<td>Confirmation Message ①</td>
<td></td>
</tr>
<tr>
<td>Condition ①</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 671: Web UI user input prompt**

**Figure 672: Slack user input prompt**

**Figure 673: Microsoft Teams user input prompt**
Boolean property sheet

Boolean controls prompt the user to answer a Yes/No question, and store the response as a string with a value of true or false. Use this value in topic utilities, like the Decision utility, to branch the topic flow based on the answer.

<table>
<thead>
<tr>
<th>Boolean property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The name that identifies this Boolean node in the topic flow.</td>
</tr>
<tr>
<td>Variable name</td>
<td>The variable that stores the choice selected by the user. The variable name is automatically created from the Name property.</td>
</tr>
<tr>
<td>Prompt</td>
<td>The prompt or question to the user. The prompt can be either a text string or a script that returns text.</td>
</tr>
<tr>
<td>Acknowledge Message</td>
<td>The message that verifies the user selection. The message can be either a text string or a script that returns text.</td>
</tr>
<tr>
<td>Default Value</td>
<td>The predefined value for the user response to the question or prompt. The value can be either a text string or a script that returns text.</td>
</tr>
<tr>
<td>Confirmation Message</td>
<td>The message that verifies the default or single-choice selection made by the user. The message can be either a text string or a script that returns text.</td>
</tr>
<tr>
<td>Condition</td>
<td>A script that specifies a condition for presenting this prompt in the conversation. The condition must evaluate to true.</td>
</tr>
</tbody>
</table>

Date Time picker

Use the Date Time picker in a Virtual Agent topic to enable the user to select a calendar date, time (hours and minutes), or both.
## Example date and time user input

### Table 1230:

<table>
<thead>
<tr>
<th>Input properties</th>
<th>Date Time Prompt</th>
</tr>
</thead>
</table>

#### User Input Properties

- **Name**: When Done
- **Variable Name**: when_done
- **Prompt**: When do you need this done by?
- **Acknowledgment Message**: (function execute() {} // Script the string !)
- **Default Value**
- **Confirmation Message**
- **Condition**
- **Format**: DateTime

#### Figure 674: Web UI prompt

**When do you need this done by?**

<table>
<thead>
<tr>
<th></th>
<th>Today</th>
<th>Yearly View</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S</td>
<td>M</td>
</tr>
<tr>
<td>2018 May</td>
<td><img src="image" alt="Calendar" /></td>
<td></td>
</tr>
<tr>
<td></td>
<td>29</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>27</td>
<td>28</td>
</tr>
</tbody>
</table>

#### Figure 675: Slack prompt

**Select Time**

- 12:39 PM

**OK**
Date and Time selection for the Slack and Teams interfaces

The Slack and Microsoft Teams interfaces do not natively support a date selection widget. Date and Time selection is instead done with the buttons that are supported in these interfaces.

The Date Time user input prompts the user for a date, showing the current date and time. Click the month, day, year, or time button to modify that value. The time and day fields prompt the user to type in a new value. The month and year fields show a set of buttons with the current and upcoming months or years. Select one of these buttons, or type in a value to set the time or year.
## Date Time property sheet

<table>
<thead>
<tr>
<th>Date Time property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The name that identifies this date and time node in the topic flow.</td>
</tr>
<tr>
<td>Variable name</td>
<td>The name of the variable that stores the user response to this prompt. The variable name is automatically created from the Name property.</td>
</tr>
<tr>
<td>Prompt</td>
<td>The prompt or question to the user. The prompt can be either a text string or a script that returns text.</td>
</tr>
<tr>
<td>Acknowledge Message</td>
<td>The message that verifies the user selection. The message can be either a text string or a script that returns text.</td>
</tr>
<tr>
<td>Default Value</td>
<td>The predefined value for the user response to the question or prompt. The value can be either a text string or a script that returns text.</td>
</tr>
<tr>
<td>Confirmation Message</td>
<td>The message that verifies the default or single-choice selection made by the user. The message can be either a text string or a script that returns text.</td>
</tr>
<tr>
<td>Condition</td>
<td>A script that specifies a condition for presenting this prompt in the conversation. The condition must evaluate to true.</td>
</tr>
<tr>
<td>Format</td>
<td>The type of date-time picker to be displayed. Select one of the following formats:</td>
</tr>
<tr>
<td></td>
<td>• DateTime — Shows both a monthly calendar and time picker.</td>
</tr>
<tr>
<td></td>
<td>• Time — Shows only the time picker for the user to select the time (hours and minutes).</td>
</tr>
</tbody>
</table>

### Image Picker

Use the Image Picker in a Virtual Agent topic to prompt a user to upload an image. After the user uploads the image file, the image appears immediately in the Virtual Agent client.
Example image picker

<table>
<thead>
<tr>
<th>Image properties</th>
<th>Image Picker Prompt</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>User Input Properties</strong></td>
<td><strong>Figure 677: Web UI prompt</strong></td>
</tr>
<tr>
<td>Image Basic Info</td>
<td></td>
</tr>
<tr>
<td>* Name</td>
<td>Please upload an image.</td>
</tr>
<tr>
<td></td>
<td><img src="image.jpg" alt="Image" /></td>
</tr>
<tr>
<td>* Variable Name</td>
<td>Please upload an image.</td>
</tr>
<tr>
<td>image_upload_test</td>
<td><img src="image.jpg" alt="Image" /></td>
</tr>
<tr>
<td>* Prompt</td>
<td>Please upload an image.</td>
</tr>
<tr>
<td></td>
<td><img src="image.jpg" alt="Image" /></td>
</tr>
<tr>
<td>Acknowledge Message</td>
<td>Please upload an image.</td>
</tr>
<tr>
<td>Response on complete</td>
<td><img src="image.jpg" alt="Image" /></td>
</tr>
<tr>
<td>Condition</td>
<td>Please upload an image.</td>
</tr>
<tr>
<td><img src="image.jpg" alt="Image" /></td>
<td><img src="image.jpg" alt="Image" /></td>
</tr>
</tbody>
</table>

Figure 678: Slack prompt

![Image](image.jpg)

Figure 679: Microsoft Teams prompt

![Image](image.jpg)

**Image picker properties**

The image that can be uploaded must be a .jpg, .png, .bmp, .gif, .jpeg, or .ico file format. The image can be high resolution, but the image displayed in the Virtual Agent client is scaled based on the aspect ratio. Images scale to fit within the chat window.
### Image picker property

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The name that identifies the image picker node in the topic flow.</td>
</tr>
<tr>
<td>Variable name</td>
<td>The name of the variable that stores the user response to this prompt. The variable name is automatically created from the Name property.</td>
</tr>
<tr>
<td>Prompt</td>
<td>The prompt to the user asking them to upload an image. The prompt can be a text string that includes variables or a script that returns text.</td>
</tr>
<tr>
<td>Acknowledge Message</td>
<td>The message that verifies the user selection. The message can be either a text string or a script that returns text.</td>
</tr>
<tr>
<td>Condition</td>
<td>A script that specifies a condition for using the image picker.</td>
</tr>
</tbody>
</table>

#### Using the image picker in different client interfaces

The process to select an image differs based on the Virtual Agent client interface. Use the following steps to select an image in the client interface of your choice.

<table>
<thead>
<tr>
<th>Platform</th>
<th>Steps to select an image</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web UI</td>
<td>1. Click the Click here to upload a file button.</td>
</tr>
<tr>
<td></td>
<td>2. Choose an image file from your local computer.</td>
</tr>
<tr>
<td>Slack</td>
<td>1. Click the Green + icon.</td>
</tr>
<tr>
<td></td>
<td>2. Select Your computer.</td>
</tr>
<tr>
<td></td>
<td>3. Choose an image file from your local computer.</td>
</tr>
<tr>
<td>Microsoft Teams</td>
<td>1. On your local computer, copy an image file.</td>
</tr>
<tr>
<td></td>
<td>2. Paste the image file into the text input field in Teams.</td>
</tr>
</tbody>
</table>

### Carousel user input

Use the Carousel in a Virtual Agent topic to present a prompt and a horizontal series of labeled images. The user can select a single item from the carousel.
Example carousel

Table 1233:

<table>
<thead>
<tr>
<th>Carousel properties</th>
<th>Carousel Prompt</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Here's what I have available.</td>
</tr>
<tr>
<td></td>
<td>&quot;Classic&quot; Cellphone</td>
</tr>
</tbody>
</table>

Figure 680: Web UI prompt

User Input Properties

Carousel Basic Info

- **Name**
  - Test Carousel

- **Variable Name**
  - test_carousel

- **Prompt**
  - Here's what I have available.

- **Acknowledgment Message**
  - function execute(" /* Script the string! */

- **Default Value**

- **Confirmation Message**

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### Carousel property sheet

<table>
<thead>
<tr>
<th>Carousel properties</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The name that identifies this carousel node in the topic flow.</td>
</tr>
<tr>
<td>Variable name</td>
<td>The name of the variable that stores the selection made by the user. The variable name is automatically created from the Name property.</td>
</tr>
<tr>
<td>Prompt</td>
<td>The prompt to the user. The prompt can be a text string or a script that returns the prompt string.</td>
</tr>
<tr>
<td>Acknowledge Message</td>
<td>The message that verifies the user selection. The message can be either a text string or a script that returns text.</td>
</tr>
<tr>
<td>Default Value</td>
<td>The predefined value for the user response to the question or prompt. The value can be either a text string or a script that returns text. The user is prompted with a Yes/No prompt to accept this value. If the user selects No at this prompt, no value is used.</td>
</tr>
<tr>
<td>Confirmation Message</td>
<td>The message that appears when the carousel has a default value or only a single choice is available. The user is prompted with a Yes/No prompt to accept this value.</td>
</tr>
</tbody>
</table>

Figure 683: Microsoft Teams prompt
Carousel properties | Description
--- | ---
Condition | A script that specifies a condition for presenting this prompt in the conversation. The condition must evaluate to true.
Carousel Item Expression | Use script to create items for selection in your carousel. The script should return an array containing one or more items.
No records response record | The message indicating that no records were found. The message can be either a text string or a script that returns text.

**Example carousel item expression**

```javascript
var options = [];
options.push(
    {
        'Name': 'Item 1,
        'Value': 'item_1',
        'Body': 'https://images.pexels.com/photos/688666/pexels-photo-688666.jpeg'
    });
options.push(
    {
        'Name': 'Item 2,
        'Value': 'item_2',
        'Body': 'https://images.pexels.com/photos/916472/pexels-photo-916472.jpeg'
    });
return options;
```

Script in the Carousel Item Expression property defines and returns an array containing the items that appear in your carousel. The elements of this array must contain Name, Value, and Body keys. In the preceding example, the script creates an array called options, and added two elements, each with the required keys. The images here are hard-coded as an example.

### Table 1234:

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The name of the carousel item. This name is shown below the image on the carousel.</td>
</tr>
<tr>
<td>Value</td>
<td>The value for the item. When a user selects a carousel item, this value is stored in the variable named in the Variable name property.</td>
</tr>
<tr>
<td>Body</td>
<td>The image used in the carousel item. The value is a URL for an image file.</td>
</tr>
</tbody>
</table>

**Virtual Agent Designer bot responses**

Virtual Agent Designer offers various controls for displaying bot responses in a conversation.
Text response

Use Text output in a Virtual Agent topic to display a text bot response.

Example text response

### Table 1235:

<table>
<thead>
<tr>
<th>Response properties</th>
<th>Text output</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Response Properties</strong></td>
<td></td>
</tr>
<tr>
<td>Text Output: Basic Info</td>
<td></td>
</tr>
<tr>
<td>* Name ①</td>
<td></td>
</tr>
<tr>
<td>Text Output</td>
<td></td>
</tr>
<tr>
<td>* Response Message ①</td>
<td></td>
</tr>
<tr>
<td>Hello!</td>
<td></td>
</tr>
<tr>
<td>Condition ①</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 684: Web UI Text output

Figure 685: Slack Text output

Figure 686: Microsoft Teams Text output

Text response properties

<table>
<thead>
<tr>
<th>Text response property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The name that identifies the text response node in the topic flow.</td>
</tr>
<tr>
<td>Response message</td>
<td>The text response to the user, either a text string or a script that returns a text string. The script can include Glide record variables or script variables.</td>
</tr>
<tr>
<td>Text response property</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Condition</td>
<td>A script that specifies a condition for presenting this response in the conversation. The condition must return a value of true to display the text.</td>
</tr>
</tbody>
</table>

**Example text response script**

```javascript
(function execute() {
   return 'Hello ' + gs.getUser().getFirstName();
})()
```

In the preceding example, the script returns a string that greets the user. In this example, `gs.getUser().getFirstName()` is used to append the current user's first name.

**Image response**

Use Image Output in a Virtual Agent topic to display an image from a URL link. The image aspect ratio determines how the image is sized in the bot chat bubble.

**Example image output**

<table>
<thead>
<tr>
<th>Response properties</th>
<th>Image response output</th>
</tr>
</thead>
</table>
| ![Response Properties](https://images.pexels.com/photos/109371/)
| ![Image Output Test](https://images.pexels.com/photos/109371/)
| ![Image URL Link](https://images.pexels.com/photos/109371/)
| ![Condition](https://images.pexels.com/photos/109371/)

Figure 687: Web UI image response output
<table>
<thead>
<tr>
<th>Response properties</th>
<th>Image response output</th>
</tr>
</thead>
</table>

**Figure 688:** Slack image response output

**Figure 689:** Microsoft Teams image response output

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Image response properties

<table>
<thead>
<tr>
<th>Image response property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Required. The name that identifies the Image response node in the topic flow.</td>
</tr>
<tr>
<td>Image URL Link</td>
<td>The URL link to an image file.</td>
</tr>
<tr>
<td>Condition</td>
<td>A script that specifies a condition for presenting this image in the conversation. The condition must return a value of true to display the image.</td>
</tr>
</tbody>
</table>

**Note:** Third-party messaging applications may place restrictions on the maximum size of an image displayed within a conversation. For details on the maximum image size allowed, check the documentation for the messaging application. For example, Microsoft Teams supports a maximum image size of 1024 x 1024 pixels and 1-MB file size for PNG, JPEG, and GIF files (see Microsoft Teams Developer documentation on conversations). Also, sometimes in MS Teams bot conversations, images may not fully render and appear cropped. Scroll up and down in the messaging window to view the image.

Link response

Use the Link output element in a Virtual Agent topic to present a bot response that contains a header prompt and a single URL link to an item. For example, you can provide a link to a website page or to a particular record, such as an incident.
Example link response element

Table 1237:

<table>
<thead>
<tr>
<th>Output properties</th>
<th>Link response output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td><img src="now" alt="Show Logs" /> <strong>Now Support</strong> <img src="more" alt="..." /></td>
</tr>
<tr>
<td>Header</td>
<td>![Here is a link](Click Here)</td>
</tr>
<tr>
<td>Label</td>
<td>![Click Here](Click Here)</td>
</tr>
<tr>
<td>URL</td>
<td>![<a href="https://www.google.com">https://www.google.com</a>](Click Here)</td>
</tr>
</tbody>
</table>

Figure 690: Web UI link response output

![virtualagent](current) **2:40 PM** ![Click Here](Click Here)  
Here is a link

Figure 691: Slack link response output

![Click Here](Click Here)  
Here is a link

Figure 692: Microsoft Teams link response output

<table>
<thead>
<tr>
<th>Link response properties</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The name that identifies the text response node in the topic flow.</td>
</tr>
</tbody>
</table>
### Link property

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Header</td>
</tr>
<tr>
<td>Label</td>
</tr>
<tr>
<td>URL</td>
</tr>
<tr>
<td>Condition</td>
</tr>
</tbody>
</table>

**HTML response**

Use the HTML output control to display static HTML text in the Virtual Agent bot response.

**Example HTML output**

The HTML response shows a static HTML as a chat response. The example shown here includes an image, headings, and paragraph text. The web UI presents this content as HTML. The Slack and Teams UI displays the same content as a .png image. URL links within the HTML are extracted and displayed below the image.
Table 1238:

<table>
<thead>
<tr>
<th>HTM response properties</th>
<th>Card output</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Response Properties</strong></td>
<td><strong>Html Basic info</strong></td>
</tr>
<tr>
<td>Name</td>
<td>HTML Use Case Demo</td>
</tr>
<tr>
<td>HTML Message</td>
<td>&lt;html&gt; &lt;body&gt; &lt;center&gt;&lt;img src='https:.'&gt;&lt;/center&gt;&lt;/body&gt;</td>
</tr>
<tr>
<td>Height (Pixel)</td>
<td>0</td>
</tr>
<tr>
<td>Width (Pixel)</td>
<td>0</td>
</tr>
<tr>
<td>Condition</td>
<td></td>
</tr>
</tbody>
</table>

Figure 693: Web UI HTML output

Figure 694: Slack HTML output
## HTML response properties

<table>
<thead>
<tr>
<th>HTML response property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The name that identifies the HTML output node in the topic flow.</td>
</tr>
<tr>
<td>HTML Message</td>
<td>The HTML output to be displayed. Click the Edit icon to open the HTML editor.</td>
</tr>
<tr>
<td>Height (Pixel)</td>
<td>The maximum height of the area for displaying HTML output in third-party messaging applications.</td>
</tr>
<tr>
<td>Width (Pixel)</td>
<td>The maximum width of the bot bubble for displaying HTML output in third-party messaging applications.</td>
</tr>
</tbody>
</table>

**Note:** As shown in the examples, HTML output can vary in third-party messaging applications. Determine an appropriate Height and Width area by previewing the HTML output in the messaging applications you intend to use, then adjusting the height and width values.
Multi-flow Output

Use the Multi-flow Output in a Virtual Agent topic to sequentially display two or more outputs (text, image, link, or HTML). Includes a navigation button that enables the user to move from one output to the next.
Example multi-flow output

Table 1239:

<table>
<thead>
<tr>
<th>Output properties</th>
<th>Multi-flow output</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Response Properties</strong></td>
<td><img src="image" alt="Response Example" /></td>
</tr>
<tr>
<td>Multi-flow Output Basic Info</td>
<td><img src="image" alt="Web UI Multi-flow Output" /></td>
</tr>
<tr>
<td>Name</td>
<td>Test Flow</td>
</tr>
<tr>
<td>Condition</td>
<td>&lt;&gt;</td>
</tr>
<tr>
<td><strong>Response Messages</strong></td>
<td><img src="image" alt="Slack Multi-flow Output" /></td>
</tr>
<tr>
<td>Navigation Label</td>
<td>Click to view more</td>
</tr>
<tr>
<td>Add a Response</td>
<td><img src="image" alt="Virtual Agent" /></td>
</tr>
<tr>
<td>Response Type</td>
<td>Value</td>
</tr>
<tr>
<td>Text</td>
<td>Test</td>
</tr>
<tr>
<td>Link</td>
<td><img src="image" alt="Link" /></td>
</tr>
</tbody>
</table>

Figure 696: Web UI multi-flow output

Figure 697: Slack multi-flow output
<table>
<thead>
<tr>
<th>Multi-flow output property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The name that identifies this multi-flow output node in the topic flow.</td>
</tr>
<tr>
<td>Condition</td>
<td>A script that specifies a condition for presenting this output in the conversation. The condition must return a value of true to display the output.</td>
</tr>
<tr>
<td>Response messages</td>
<td></td>
</tr>
<tr>
<td>Navigation Label</td>
<td>The label for the button displayed below the output. The button enables the user to move to the next output in the flow.</td>
</tr>
<tr>
<td>Multi-flow output property</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| Add a response             | For each output type, click + Add a Response to specify the output and define the output properties.  
1. In the Add a Response dialog box, select the Type, and specify the associated values:  
   • Text — Enter the text to be displayed in the response.  
   • Image — Enter the Header, Prompt (label for the link), and the URL link to the image.  
   • Link — Enter the Header, Prompt (label for the link), and the URL link.  
   • HTML — Enter the Height and Width, in pixels, to set the dimensions of the HTML block. In the HTML editor, enter the HTML markup to be displayed.  
2. Click Save. |

**Script Output**

Use Script Output in a Virtual Agent topic to run a script that returns a single response or a multi-part response.

**Example script output**

Use the script output response when creating a more complex response that relies on scripted calculations, or requires a multi-part response. Scripted output can include text, image, cards, links, and HTML, to create a versatile response.
### Table 1240:

<table>
<thead>
<tr>
<th>Output properties</th>
<th>Script output</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Response Properties</strong></td>
<td><img src="https://via.placeholder.com/150" alt="Image" /></td>
</tr>
<tr>
<td><strong>Script Basic Info</strong></td>
<td><img src="https://via.placeholder.com/150" alt="Image" /></td>
</tr>
<tr>
<td>Name</td>
<td>Test Script Output</td>
</tr>
<tr>
<td>Script Output Type</td>
<td>Single-Part</td>
</tr>
<tr>
<td>Script Response Message</td>
<td>(function execute外形()</td>
</tr>
<tr>
<td>Condition</td>
<td></td>
</tr>
</tbody>
</table>

#### Script output properties

<table>
<thead>
<tr>
<th>Script output properties</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The name that identifies the script output node in the topic flow.</td>
</tr>
<tr>
<td>Script Output Type</td>
<td>The type of output returned by the script: single-part or multi-part.</td>
</tr>
<tr>
<td>Script Response Message</td>
<td>The script that generates the selected output type (single or multi-part).</td>
</tr>
<tr>
<td>Condition</td>
<td>A script that specifies a condition for presenting this output in the conversation. The condition must return a value of true to display the output.</td>
</tr>
</tbody>
</table>
Example script

(function execute() {
  var gdt = new GlideDateTime();
  var gt = new GlideTime();
  gdt.addSeconds(7200);
  gt = gdt.getTime();
  var multiOutMsg = new sn_cs.MultiPartOutMsg();
  multiOutMsg.addPlainTextPart('Thank you for submitting an incident.');
  multiOutMsg.addPlainTextPart('You should receive a response from a technician by ' + gt.getByFormat('HH:mm'));
  return multiOutMsg;
})()

In the preceding example, the script calculates the time two hours from the current time and outputs a multi-part message that includes this information.

Card response

Use the Card response in a Virtual Agent topic to display selected information from a record on your instance, such as an incident.

Example card output

The Card response shows content from a record in a compact format designed for readability within the chat window. The record content includes the display field for the table the top of the card followed by any other fields specified by the properties of the bot response.
### Table 1241:

<table>
<thead>
<tr>
<th>Response properties</th>
<th>Card output</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name</strong></td>
<td><strong>Inquiry / Help</strong></td>
</tr>
<tr>
<td>Status Card</td>
<td><strong>Number</strong> INC0010003</td>
</tr>
<tr>
<td><strong>Reference Type</strong></td>
<td><strong>Short description</strong> Test Incident</td>
</tr>
<tr>
<td>Record</td>
<td><strong>Assigned to</strong> Support User</td>
</tr>
<tr>
<td><strong>Record</strong></td>
<td><strong>State</strong> In Progress</td>
</tr>
<tr>
<td>Here It Is</td>
<td></td>
</tr>
<tr>
<td><strong>fields</strong></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td></td>
</tr>
<tr>
<td>Short description</td>
<td></td>
</tr>
<tr>
<td>Assigned to</td>
<td></td>
</tr>
<tr>
<td>State</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 702: Web UI card output**

**Figure 703: Slack card output**
**Card properties**

The contents of the card must come from a single record on your instance. This record can be referenced from variables in the flow, or queried using a script that returns a single Glide record from a selected table. Use the card properties to define which record is used and what fields are displayed from that record.

<table>
<thead>
<tr>
<th>Card property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The name that identifies the Card node in the topic flow.</td>
</tr>
</tbody>
</table>
| Reference Type| The reference to a specific record in a table. Choose one of the following options:  
  - Record — Data for the card comes from a record referenced in a variable from another node in the flow, for example, a Choice List or Glide Action.  
  - Script — Data for the card comes from a script that returns a single Glide record from a specified table. |
<table>
<thead>
<tr>
<th>Card property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Record</td>
<td>When the Reference Type property is set to Record, this property appears as a list. Use this list to select a variable from the current flow that contains a record object. Information from this record is shown in the card. When the Reference Type field is set to script. Use this field to input a script that returns the record. Information from this record is shown in the card.</td>
</tr>
<tr>
<td>Table</td>
<td>If the Reference Type is Script, select the table containing the record.</td>
</tr>
<tr>
<td>fields</td>
<td>The fields from the ServiceNow record to be displayed in the card. Click +Add Field to specify each field.</td>
</tr>
<tr>
<td>Condition</td>
<td>A script that specifies a condition for presenting this card in the conversation. The condition must return a value of true to display the card.</td>
</tr>
</tbody>
</table>

**Example Glide record query**

```javascript
(function execute(table) {
    /* Write a glide record query, and return the glide record. For example:
     *
     * var gr = new GlideRecord(table);
     * gr.addEncodedQuery('active=true^number=INC0010099');
     * gr.query();
     * if(gr.next()) {
     *    return gr;
     *}
     */
}(table))
```

In the preceding example, the script creates a GlideRecord object, populates this object using a query that should return a single result, then returns the object. The Table property defines the table used in this query.

**Virtual Agent Designer Utilities**

Virtual Agent Designer offers various actions for controlling interactions within a topic, such as running a script or adding different conversation paths (branches) in a topic. Utilities are represented as nodes in a conversation flow but do not display anything to the user.

**Lookup utility**

Use the Lookup utility in a Virtual Agent topic to return a ServiceNow record query.
Example Lookup utility

Prompt Properties

- **Name**: Lookup Record
- **Variable Name**: reference_81
- **Condition**: 

Reference Settings

- **Table**: Incident [incident]
- **Script**: 

<table>
<thead>
<tr>
<th>Lookup property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The name that identifies the Lookup node in the topic flow.</td>
</tr>
<tr>
<td>Variable Name</td>
<td>The variable that stores the record returned by the script.</td>
</tr>
<tr>
<td>Condition</td>
<td>A script that specifies a condition for executing this lookup. The condition must return a value of true for the lookup to execute.</td>
</tr>
</tbody>
</table>
Example Lookup script

(function execute(table) {
  var gr = new GlideRecord(table);
  gr.addEncodedQuery('active=true');
  gr.setLimit(1);
  gr.query();
  if(gr.next()) {
    return gr;
  }
})(table)

In the preceding example, a table is queried the first active. The table to be queried is defined in the Table property found in the lookup utility control. The setLimit() method ensures that only a single record is returned from the database. If a record is found, it is returned. For more information on GlideRecord queries, see Using GlideRecord to query tables.

Script Action

Use a Script Action in a Virtual Agent topic to run a script.

Example Script action
Script action properties

<table>
<thead>
<tr>
<th>Script action property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The name that identifies the Script Action node in the topic flow.</td>
</tr>
<tr>
<td>Action Expression</td>
<td>The script that performs an action.</td>
</tr>
<tr>
<td>Condition</td>
<td>A script that specifies a condition for executing this script action. The condition must return a value of true for the script action to execute.</td>
</tr>
</tbody>
</table>

Example script action

```
(function execute() {
  var list = [];
  if (vaInputs.case_number != "") {
    var gr = new GlideRecord("sn_customerservice_case");
    gr.addQuery("number", "CONTAINS", vaInputs.case_number);
    gr.addQuery("active", "true");
    gr.orderBy("number");
    gr.query();
    while (gr.hasNext()) {
      gr.next();
      list.push(gr.getUniqueValue().toString());
    }
  }
  vaVars.case_list = list;
})()
```

The preceding example performs a search on the sn_customerservice_case table for a specific case number based on the input from another control called case_number. The script then places the results in an array and stores them in the case_list variable, which is accessible by other nodes in the same topic. Because vaVars only supports string, number, and boolean values, the script uses toString() to store these values as strings. The code is contained in an if statement, so it only executes if the case_number variable has a value. This if statement prevents the code from running if user had not entered a number.

Action utility

Use the Action utility in a Virtual Agent topic to create or update a ServiceNow record.
Example action utility

Prompt Properties

- Name  
  Glide Action

- Variable Name  
  glide_action

Condition

Action Setting

- Action Type  
  Create a Record

- Table  
  Incident [incident]

- Field  
  Field  Value
  short_description  Test Incident
  active  true

+ Add Field
**Action properties**

Specify the table for which the record is to be created. To update a record, specify the fields in the record to be modified.

<table>
<thead>
<tr>
<th>Action property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The name that identifies the Action node in the topic flow.</td>
</tr>
<tr>
<td>Variable Name</td>
<td>The name of the Glide variable that is automatically created from the Name field.</td>
</tr>
<tr>
<td>Condition</td>
<td>A script that specifies a condition for executing this action. The condition must return a value of true for the action to execute.</td>
</tr>
<tr>
<td>Action Setting</td>
<td></td>
</tr>
<tr>
<td>Action Type</td>
<td>The action to be performed in the instance. Choose one of the following options:</td>
</tr>
<tr>
<td></td>
<td>• Create a Record</td>
</tr>
<tr>
<td></td>
<td>• Update a record</td>
</tr>
<tr>
<td>Table</td>
<td>If the Action Type is Create a Record, select the ServiceNow table for which the record is to be added.</td>
</tr>
<tr>
<td>Record</td>
<td>If the Action Type is Update a Record, select the variable for the GlideRecord. The available variables are referenced from another node in the flow, such as a choice list.</td>
</tr>
<tr>
<td>Action property</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Field</td>
<td>The fields from the table to be operated on:</td>
</tr>
<tr>
<td></td>
<td>1. Click + Add Field to specify the field and field values.</td>
</tr>
<tr>
<td></td>
<td>2. In the Field Values form, enter the value. This value can be added in one of two methods.</td>
</tr>
<tr>
<td></td>
<td>• Enter a static value into the text field.</td>
</tr>
<tr>
<td></td>
<td>• Use a value stored in a variable. Access your available variables by press Control + Space or click the Insert Reference button.</td>
</tr>
<tr>
<td></td>
<td>3. Click Save.</td>
</tr>
<tr>
<td></td>
<td>4. Repeat steps 1 through 3 for each field to be added.</td>
</tr>
</tbody>
</table>

**Decision utility**

Use the Decision utility in a Virtual Agent topic to add two or more branches that represent different paths in a conversation.
In the preceding example, a static choice control prompts the user to select from three available colors, which is stored in a variable. The decision utility control is configured with a branch for each possible selection. Each branch contains a script in the Condition property that returns true when a specific color is selected. In the preceding example, the script returns true when the choice is "Blue."

**Add a decision utility with branches**

1. Drag the Decision utility onto the canvas.
   
   The Decision added to the canvas has a single branch named Always by default.
2. Click the + (plus) sign under the node.
   
   A second branch named Never is added below the Decision node.
3. To add additional branches, click the + (plus) sign.
4. For each branch, specify the branch properties: Name of the branch and Condition for displaying that branch.

**Use scripts to set conditions for branches**

Each branch below a decision node has a condition property. Add a script to this property that returns a value of true or false. A branch that returns a value of true is followed, while a branch returning a value of false is not. When creating these scripts, ensure that only one branch in each decision evaluates to true.
Virtual Agent scripts

Admins and users with the virtual_agent_admin role can use scripts to customize the behavior of Virtual Agent topics.

Virtual Agent scripts run on the server. Scripts can provide context for topics, such as retaining information about a user or a user's input. You can use this information to personalize a conversation, for example to present a scripted greeting or confirmation. Scripts can also specify certain actions to be performed on information obtained during a conversation, such as creating or updating ServiceNow records.

Scripts run in the scope in which a topic is defined. All scope protections apply. If you are developing a conversation for a scoped application, you must use the scoped API. You can use most APIs that run in server scripts.

User input and ServiceNow record variables

In Virtual Agent, the following variables are available for use in scripts that you create for a topic.

User input variables

When you add an input control to a topic, the system automatically creates a variable to store the user input (string object). The syntax is vaInputs.myvar where myvar is the name you assigned to the input node.

For example, a text input prompt with the name First prompt has a system-defined variable called vaInputs.first_prompt. Spaces in the name are replaced with an underscore character and uppercase characters are changed to lower-case.

ServiceNow record variables

If you create a script for a topic that queries a ServiceNow table, the record object (GlideRecord) returned is automatically available for use in the topic. The variable syntax is vaInputs.myvar where myvar is the record object. For details on querying ServiceNow tables to return a record object, see Using GlideRecord to query tables.

Use dot-walking in variables that contain a ServiceNow record to specify a particular field in the table. The syntax is vaInputs.myvar.field. For details on dot walking within a script, see Dot-walking examples.

Accessing user input and ServiceNow record variables

Use vaInputs object, for example vaInputs.myvar == "expected value" to access ServiceNow record variables in scripts. To access values from user inputs that are not records, use vaInputs.myvar.getValue().

The following methods are available.

• vaInputs.myvar == "expected value") evaluates whether myvar matches an expected value.
**Note:** Values for user input variables are assigned using user input controls. These values cannot be changed in your scripts.

- If myvar is a GlideDateTime variable, the date and time value is formatted as a string, for example: 2018-12-11 17:45:23
- By default, the user variable is available and is a reference to the sys_user record for the user.
- valInputs.myvar.getValue(); returns the value.
- valInputs.myvar.getDisplayValue(); If the stored value is not a ServiceNow record, this method returns the display value. For variables that contain ServiceNow records, this method returns the display value, as defined by the display field for that table.

### Choice List Setting

<table>
<thead>
<tr>
<th>Label</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>10</td>
</tr>
<tr>
<td>Orange</td>
<td>20</td>
</tr>
<tr>
<td>Pear</td>
<td>30</td>
</tr>
</tbody>
</table>

This example shows the label and choice values for a user input. In this case myVar.getValue() would return a value of 10, 20, or 30, while myVar.getDisplayValue() would return Apple, Orange, or Pear.

- valInputs.myvar.getDefaultValue(); returns the default value in a confirmation message.
- valInputs.myvar.getDefaultDisplayValue(); returns the display value for the default value in a confirmation message.

### Script variables

You can define script variables for information that is not stored in ServiceNow tables but can be used to share that information elsewhere in a topic. Script variables are similar to workflow scratchpad variables that store primitives such as integers, boolean values, or strings. A string value can be either a static or...
dynamic scripted value. Create these variables using the Script Variables sidebar in the Virtual Agent Designer page.

![Script Variables sidebar](image)

**Figure 705: Script Variables sidebar**

**Note:** Script variables are intended for use by topic authors with advanced scripting skills.

The variable syntax is `vaVars.myvar` where `myvar` is the name you assign to the variable. For example, you can assign a value to the variable using `vaVars.myvar = value;`. Unlike user input variables, script variables can be assigned values in a script.

To define a script variable:

1. In the Virtual Agent Designer page, click the + plus sign for Script Variables.
2. In the Add Script Variable window, define the variable:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable name</td>
<td>Name of the variable. The name is case-sensitive. Spaces in the name are replaced with an underscore character.</td>
</tr>
<tr>
<td>Default value</td>
<td>Either a static value or a script that specifies a dynamic value for this variable.</td>
</tr>
</tbody>
</table>

3. Click Save.
**Live Agent variables**

The following Live Agent variables are available for use in topic scripts:

- application
- queue
- short_description

For example, you can use the queue variable to control the chat queues used in a topic.

The variable syntax is `vaVars.LiveAgent_myvar` where `myvar` is one of the available Live Agent variables specified in Live Agent setup. Access the variable using `vaVars.LiveAgent_myvar = value;`

To use Live Agent variables in topic scripts, enable the Live Agent toggle switch (under Script Variables) in the Virtual Agent Designer page.

**Context variables**

Variables can be used in system parameters within the web client URL. These variables can be used anywhere in the conversation using the `vaContext` object. Use these options to create links to Virtual Agent with predefined variables.

```plaintext
https://<instance>.service-now.com/$sn-va-web-client-app.do?
sysparm_city=London
```

The preceding link contains a parameter, `sysparm_city=London`. In addition to opening a Virtual Agent conversation, using this link creates a variable called `city`, with a value of London. This variable can be accessed in a script using `vaContext.city`.

**vaSystem methods**

Use methods in the `vaSystem` object to attach images to records, access the search string used to find the current topic, or transfer the user to a live agent queue.

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
</table>
| `vaSystem.attachToRecord(String mediaId, String tableName, String sysId)` | This method attaches an image to a record. The method uses three parameters:
  - `mediaId`: The path for the image to be attached. Use `getValue()` on an image input variable to use an image entered by the customer. For example, `vaInputs.image_input.getValue()`.
  - `tableName`: A string containing the name of the table.
  - `sysId`: The `sys_id` of the record. |
<p>| <code>vaSystem.getSearchText()</code> | This method returns the search string used to find the current topic. |</p>
<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>vaSystem.connectToAgent()</td>
<td>This method ends the current conversation and connects the customer to a live agent queue. For more information on this method, see Transferring Virtual Agent conversations to a live agent on page 3088.</td>
</tr>
</tbody>
</table>

**Virtual Agent localization**

Use the Message [sys_ui_message] table to provide translations for Virtual Agent topics and accommodate users from different countries.

**Using localization for Virtual Agent**

If you use multiple languages on your instance, or plan to do so, use localization methods in your Virtual Agent scripts to ensure that the content can be translated. Localization methods are designed to show the original text when no translation is found. These methods can be applied to your code before translations have been created.

**Use the Message table to store translation text**

The Message [sys_ui_message] table stores translation for informational messages, and is used to store translation for elements in your topic. Predefined topics have already been translated, but you must provide translations for any content you create for your instance. Information on the Message table can be found here: Message table

**Use the gs.getMessage function to access stored translations**

The gs.getMessage method checks the Message table for the translated version of the text in the language selected for the current user.

**Example of localization in a script**

```javascript
(function execute() {
    return 'Hi there ' + vaInputs.first_name;
})()
```

The preceding code provides a greeting that dynamically adds the value of the first_name variable. Here is that same code, rewritten for localization.

```javascript
(function execute() {
    return gs.getMessage('Hi there {0}', [vaInputs.first_name]);
})()
```

The preceding example uses the gs.getMessage method. The text is the same as the previous example, but the format is changed. The number in brackets acts as a placeholder for the variable, which is then listed in an array after the comma. The gs.getMessage method looks for a record on the Message table with a key value matching Hi there {0}, and a language value matching the current language. The method returns the translated version of the text, which is stored in the message field of the record.
Visual Task Boards

Visual Task Boards (VTB) transform the navigation of lists and forms into an interactive graphical experience.

With Visual Task Boards, you can view and update multiple task records, which appear as cards that can be moved between lanes. An activity stream on the board displays recent activity so you can easily track changes to tasks. You can add task cards from any table that extends Task to intuitively and easily track updates and edit records directly from the board. Any user can use task boards, regardless of role, though access control rules (ACLs) may limit which cards each user can see. The Visual Task Board interface provides a graphic-rich environment suited for managing and collaborating on records. For example, a support manager might create a board for her team to track their assigned incidents by state in real time.

This video demonstrates how Visual Task Boards work.

Activate Visual Task Boards

Visual Task Boards are active by default on new instances. For upgraded instances, you can activate the Visual Task Boards plugin [com.glide.ui.vtb] if you have the admin role.

Role required: admin
1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.

If the plugin depends on other plugins, these plugins are listed along with their activation status.
If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).

4. If available, select the Load demo data check box.

Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.

You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.

5. Click Activate.

**Domain separation in Visual Task Boards**

This is an overview of domain separation in the Visual Task Boards application. Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.

**Overview**

Support: Data only

Domain separation in this application is supported at the Data only level, meaning it supports the data security model of separating visibility of data from one domain to another. To learn more, see Application support for domain separation.

**Installed with Visual Task Boards**

Several types of components are installed with Visual Task Boards.

**Tables installed with Visual Task Boards**

Tables are added with activation of Visual Task Boards.

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Board Member [vtb_board_member]</td>
<td>Stores a record for each member of each task board.</td>
</tr>
<tr>
<td>Private Task [vtb_task]</td>
<td>Stores a record for each personal task on each freeform board.</td>
</tr>
<tr>
<td>Visual Task Board [vtb_board]</td>
<td>Stores a record for each task board.</td>
</tr>
<tr>
<td>Visual Task Board Card [vtb_card]</td>
<td>Stores a record for each task card on each task board.</td>
</tr>
</tbody>
</table>
### Table Description

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual Task Board Card History [vtb_card_history]</td>
<td>Stores records for certain task card changes, such as lane or assignee changes. Each record indicates the previous value and the new value.</td>
</tr>
<tr>
<td>Visual Task Board Lane [vtb_lane]</td>
<td>Stores a record for each lane on each task board.</td>
</tr>
</tbody>
</table>

### Properties installed with Visual Task Boards

Properties are added with activation of Visual Task Boards.

**Note:** To open the System Property [sys_properties] table, enter `sys_properties.list` in the navigation filter.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>vtb.board.upload_limit</td>
<td>Sets the maximum file size in megabytes allowed for each task card attachment.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 10</td>
</tr>
<tr>
<td></td>
<td>• Location: System Property [sys_properties] table</td>
</tr>
</tbody>
</table>

### Script includes installed with Visual Task Boards

Script includes are added with activation of Visual Task Boards.

<table>
<thead>
<tr>
<th>Script include</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VisualTaskBoards</td>
<td>Provides general utilities for Visual Task Boards.</td>
</tr>
<tr>
<td>VTBBoardSecurity</td>
<td>Provides security utilities to control board access.</td>
</tr>
<tr>
<td>VTBGetBoardsByUser</td>
<td>Provides a method that retrieves all the boards a specified user owns or is a member of.</td>
</tr>
<tr>
<td>VTBTaskSecurity</td>
<td>Provides security utilities to control task access.</td>
</tr>
</tbody>
</table>

### Client scripts installed with Visual Task Boards

Client scripts are added with activation of Visual Task Boards.

<table>
<thead>
<tr>
<th>Client script</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add Kanban Choice</td>
<td>Visual Task Board [vtb_board]</td>
<td>Adds the -- Kanban Board -- option to the Lane field field. This option indicates that the task board is a flexible board.</td>
</tr>
</tbody>
</table>
## Business rules installed with Visual Task Boards

Business rules are added with activation of Visual Task Boards.

<table>
<thead>
<tr>
<th>Business rule</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add members to live group</td>
<td>Board Member [vtb_board_member]</td>
<td>If a Connect Chat conversation is created for a task board, this business rule adds the board members as conversation members.</td>
</tr>
<tr>
<td>Remove member from live group</td>
<td>Board Member [vtb_board_member]</td>
<td>If a Connect Chat conversation exists for a task board and a user is removed from the board members, this business rule removes the user from the conversation members.</td>
</tr>
<tr>
<td>Remove member from VTB</td>
<td>Live Group Member [live_group_member]</td>
<td>If a Connect Chat conversation exists for a task board and a user is removed from the conversation members, this business rule removes the user from the task board members.</td>
</tr>
<tr>
<td>Sync board name to Connect</td>
<td>Visual Task Board [vtb_board]</td>
<td>If a Connect Chat conversation exists for a task board and someone updates the board name, this business rule updates the conversation name.</td>
</tr>
<tr>
<td>Sync chat name to VTB board</td>
<td>Live Group Profile [live_group_profile]</td>
<td>If a Connect Chat conversation exists for a task board and someone updates the conversation name, this business rule updates the board name.</td>
</tr>
<tr>
<td>Sync Members With VTB</td>
<td>Live Group Member [live_group_member]</td>
<td>If a Connect Chat conversation exists for a task board and a user is added to the conversation members, this business rule adds the user as a board member.</td>
</tr>
<tr>
<td>Update Board on Card Change</td>
<td>Visual Task Board Card [vtb_card]</td>
<td>Triggers the system to update the task board when changes occur to the cards.</td>
</tr>
<tr>
<td>Update Board on Lane Change</td>
<td>Visual Task Board Lane [vtb_lane]</td>
<td>Triggers the system to update the task board when changes occur to the lanes.</td>
</tr>
<tr>
<td>update board on lane change</td>
<td>Board Member [vtb_board_member]</td>
<td>Triggers the system to update the task board when changes occur to the board members.</td>
</tr>
<tr>
<td>Business rule</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>----------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>VTB Previous Additional</td>
<td>Private Task</td>
<td>Triggers the system to send an email notification to users when they are</td>
</tr>
<tr>
<td>Assignees</td>
<td>[vtb_task]</td>
<td>designated as additional assignees for cards.</td>
</tr>
</tbody>
</table>

Notifications installed with Visual Task Boards

Notifications are added with activation of Visual Task Boards.

<table>
<thead>
<tr>
<th>Notification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTB additional assignee notification</td>
<td>Sends an email notification to users when they</td>
</tr>
<tr>
<td></td>
<td>are designated as additional assignees for tasks.</td>
</tr>
<tr>
<td>VTB assignee notification</td>
<td>Sends an email notification to users when they</td>
</tr>
<tr>
<td></td>
<td>are designated as the primary assignees for</td>
</tr>
<tr>
<td></td>
<td>personal tasks.</td>
</tr>
<tr>
<td>VTB lane change notification</td>
<td>Sends an email notification to a task's assignees</td>
</tr>
<tr>
<td></td>
<td>when the task changes lanes.</td>
</tr>
</tbody>
</table>

Supported browsers for Visual Task Boards

The system supports Visual Task Boards on most modern browsers.

Supported browsers

- The latest public release of Firefox or Firefox ESR
- The latest public release of Chrome
- Safari version 9.1 and later
- Internet Explorer version 11
  - Edge mode is supported.
  - Compatibility mode is not supported.
  - Setting Security Mode to High (via the Internet Options Security tab) is not supported.
  - Internet Explorer 11 is susceptible to memory leaks, which may impact performance, especially in Windows 7.

- Access Visual Task Boards on your mobile device using either a browser or the native mobile app. See *Mobile supported devices* for more information.

Scripting support

Visual task boards do not interact with client scripts. Use a UI policy or a data policy instead.
Visual task board structure

There are different types of task boards for different kinds of task management. All types of boards share the same overall structure.

Table 1244: Board types

<table>
<thead>
<tr>
<th>Board type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freeform boards</td>
<td>Display any kind of task record, including personal tasks. Members of freeform boards can add and remove task cards and lanes.</td>
</tr>
<tr>
<td>Flexible boards</td>
<td>Display tasks that match the configured filter against a particular table. Members of flexible boards can add task cards, which are removed automatically when the tasks no longer match the filter conditions. Members can define custom lanes, similar to a freeform board.</td>
</tr>
<tr>
<td>Guided boards</td>
<td>Display tasks that match the configured filter against a particular table, like flexible boards. Members of guided boards can add task cards, which are removed automatically when the tasks no longer match the filter conditions. Guided board lanes correspond to field values and cannot be edited in most cases.</td>
</tr>
</tbody>
</table>

The icon beside the board name on the Task Boards page identifies the type of board. Freeform boards appear with a grid of four squares

( )

flexible boards appear with a vertical line beside two squares

( )

guided boards appear with two vertical lines

( )
Figure 706: Task Boards screen

All boards have these elements:
<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick panel</td>
<td>Displays labels and users associated with the board. Board members can use the quick panel to filter cards or to quickly label or assign tasks. Members can also configure what appears in the quick panel.</td>
</tr>
<tr>
<td>Lanes</td>
<td>Organize cards on a board into vertical groups. These groups often represent the status of the task, such as To Do, Doing, and Done. Each board is composed of one or more lanes. When using a guided board, each lane represents a possible field value. For example, a board on the Incident table can display one lane for each State value such as New, Active, or Resolved. Users can move cards from one lane to another to update the task that card represents.</td>
</tr>
<tr>
<td>Cards</td>
<td>Represent individual tasks. Users can add comments, attachments, and labels to cards and assign users to cards. Each card is tied to a task record; updating one immediately updates the other. For freeform boards, each card represents a personal task. For flexible and guided boards, each card represents a record from the list that board was created from.</td>
</tr>
<tr>
<td>Task board tools</td>
<td>Displays board information, a board members, the board activity stream, and board labels.</td>
</tr>
</tbody>
</table>
Figure 707: Board layout

- **Quick Panel**
- **Lanes**
- **Cards**

**Task board tools**

1. **I need more memory**
   - Lane: Doing, was: To Do
   - System Administrator
   - Updated: just now

2. **I need a replacement iPhone, please 2**
   - Lane: Done, was: To Do
   - System Administrator
   - Updated: just now

3. **Can't access SFA software**
   - Lane: Doing, was: To Do
   - System Administrator
   - Updated: just now

4. **Can't log into SAP from my laptop today**
   - Lane: Done, was: To Do
   - System Administrator
   - Updated: just now

5. **Issue with email**
   - Lane: Done, was: To Do
   - System Administrator
   - Updated: just now

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Visual Task Board use

Any user can create, view, and edit freeform, flexible, and guided visual task boards, and add users to these boards as members.

You can create a freeform board and add cards from multiple task tables, or create a flexible or guided board from an existing list of records.

Create a freeform board

You can create freeform task boards for tracking any kind of task or project.

Role required: none

2. Next to My Task Boards, click New, or if you have never created a task board before click Create New Visual Task Board.
3. From the Create New Board window, click Freeform.
   A new task board opens with the default freeform lanes, To Do, Doing, and Done.
4. Click the board name and enter a new name.

After the board is created, board members can:

- Add and modify lanes
- Create and modify task cards
- Add and remove members
- Configure the look and feel

Create a data driven board

You can create a flexible or guided task board for any table that extends Task, such as Incident or Change.

Role required: none

2. Next to My Task Boards, click New, or if you have never created a task board before click Create New Visual Task Board.
3. From the Create New Board window, click Data Driven Board.
4. From the Task Table list, select a base table of tasks on which to base your board, for example, an incident table.
5. From the Lane Field list, select the field you want to use for the lane headers. Create a Flexible board with editable lane headers by selecting None.
   The type of board that is created and the lanes that appear on the board depend on which type of column you select. If you select a reference or choice column, the board is a **guided board**. Each lane in a guided board represents one possible value for that column and the cards appear in the appropriate lane. For example, if you create a guided task board for incidents using the State column, the board shows one lane for each incident state, such as New or Closed. If you select a column that is not a reference or choice, the board is a **flexible board** and the board shows the default lanes, To Do, Doing, and Done, with all cards in the To Do lane.
6. Create a filter to show only the records you want to work with.
   For example, you might filter out incidents that are not assigned to you.
   Any card that no longer fits the parameters of the filter is automatically removed from the task board.
7. Click the board name and enter a new name.

**Note:** For guided boards created from choice fields, such as State, the system creates a lane for each possible choice value. For guided boards created from reference fields, the system creates a lane only for each value in use by a task card. Lanes are added as needed if the reference field values change.

After the board is created, board members can:

- Add and modify lanes
- Create and modify task cards
- Add and remove members
- Configure the look and feel

**Delete a task board**

You can delete any task board you own.

Role required: none

Deleting a board does not impact the underlying task records. However, you cannot recover a board after you delete it.

2. Under Boards you own, point to a board and click the delete icon (X).
3. In the confirmation dialog, click Delete.

**Add or modify task board lanes**

Any board member can change the names and add new lanes to accommodate the task workflow you want to track. When you create a freeform or flexible task board, it includes the default lanes To Do, Doing, and Done.

Role required: none

Unlike guided boards, the lanes on a freeform or flexible task board do not match possible field values.

**Note:** You cannot remove lanes from guided boards.

1. Open a task board.
2. Perform any of the following actions.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create a new lane</td>
<td>1. Scroll past the last lane and click Add Lane.</td>
</tr>
<tr>
<td></td>
<td>2. Enter a title for the lane, then press the Enter key.</td>
</tr>
</tbody>
</table>

The Add Lane option is always available for freeform and flexible boards. It is available for guided boards only if the lanes are based on a reference field, such as Assigned to.
<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rearrange lanes</td>
<td>Click a lane header and drag the lane to the desired drop zone. To cancel the move, press the Escape key while you drag the lane. You can also change the lane order from the board configuration menu.</td>
</tr>
</tbody>
</table>
| Hide a lane     | 1. Click the lane menu ( الثلاثة ) in a lane header.  
                  2. Select Hide Lane. 
You can restore hidden lanes from the board configuration menu. |
| Delete a lane   | 1. Click the lane menu in a lane header.  
                  2. Select Delete Lane.  
                  3. In the confirmation dialog box, click Delete.  
When you delete a lane on a freeform or flexible board, all the cards in the deleted lane are archived.  
The Delete Lane option is always available for freeform and flexible boards. It is available for guided boards only if the lanes are based on a reference field, and only for lanes that contain no cards. |

**Task cards**

Visual Task Board task cards can represent a personal task or a record on a table. You can add task cards, edit task card details, add labels to cards, and access the underlying task record the card represents, depending on the board type.

**Note:** Each board can display up to 2,000 cards by default. When the number of tasks exceeds the maximum, a warning appears and the system determines which cards to show by most recent update time. Administrators can configure a different maximum card limit for freeform boards and for flexible and guided boards.

**Freeform board tasks**

You can add personal task cards directly to lanes on a freeform board. You can also add other kinds of task cards to a freeform board from a list or form.

*Add a personal task to a freeform board*  
You can add cards directly to a freeform board lane. These cards are called personal tasks and represent records on the Private Task [vtb_task] table.
Role required: none

1. In a lane header, click the lane menu ( ) and select Add Task. Alternatively, click Add Task at the bottom of a lane. A new task card appears in the lane.
2. Enter a short description for the new task card.
3. To save the card, click another area of the board or press Enter.

Add a task to a freeform board from a form
You can add a task card to a freeform board from any table that extends Task. These cards represent records on whichever table you add them from.

Role required: none

You can add cards from multiple task tables, such as Incident or Problem, to the same freeform board.

1. Open a task record, such as an incident.
2. Click the menu icon ( ) or right-click the form header to show the form context menu.
3. Select Add to Visual Task Board. A pop-up window appears with a list of freeform task boards.

4. Click the name of the board you want to add the card to. A confirmation message appears.
5. To view the board, click the board name in the confirmation message. The task appears in the first lane by default.

Add a task to a freeform board from a list
You can add a task card to a freeform board from any table that extends Task. These cards represent records on whichever table you add them from.
Role required: none

You can add cards from multiple task tables, such as Incident or Problem, to the same freeform board.

1. Navigate to a list of task records, such as Incident Open.
2. Perform either of the following actions.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add one task</td>
<td>Right-click a record and select Add to Visual Task Board</td>
</tr>
<tr>
<td>Add multiple tasks</td>
<td>Select the check box beside each record you want to add and select Add to Visual Task Board from the actions choice list</td>
</tr>
</tbody>
</table>

A pop-up window appears with a list of freeform task boards.

3. Click the name of the board you want to add the card to.
   A confirmation message appears.
4. To view the board, click the board name in the confirmation message.
   The task appears in the first lane by default.

Data driven board tasks

You can add a task to a flexible or guided task board.

*Add a task to a flexible or guided board*

Cards in a flexible or guided board represent records on whichever table the board is associated with.

Role required: none

1. In a lane header, click the lane menu ( الثلاثة ) and select Add Task. Alternatively, click Add Task at the bottom of a lane.
A pop-up window appears with a new record. Fields are populated based on any filter conditions for the board and, for guided boards, the lane you add the card to.

Consider the example of a guided board that shows incidents with the Software category, with a lane for each assignee. If you add a card to the ITIL User lane, the new incident record Category and Assigned to fields are automatically set to Software and ITIL User.

2. Complete the form and click Submit.
   A new task card appears in the lane.

Edit card details

When you click a card on a Visual Task Board, a pop-up window appears with additional details.

Role required: none

You can edit certain values from the card details. Updating these values also updates the underlying task record.
Figure 708: Card details

1. Click a card.
   The details for that card appear in a pop-up window.
2. Alternatively, you can click an entry in the activity stream to view the details for the associated card.
3. From the card details you can:
   • Click the card title to rename the card.
- Modify the short description.
- Add comments or work notes in the activity stream.
- Edit the assignees.
- Click one or more of the available labels to add a label to the card.
- Add or remove file attachments.
- Create a checklist.
- Archive the card (freeform boards only).
- Move the card to a different board (freeform boards only).

Add an attachment to a task card
You can add an attachment to a record within a task board.

Role required: none

Adding an attachment to a task card also adds the attachment to the underlying task record.
Figure 709: Add attachment

1. Click a card.
2. Click the attachment tab

3. Click Add Attachment and select a file to add as an attachment.

Label a task card

Labels help categorize tasks and visually distinguish them on the task board.

*Enable* labels for the board.

Role required: none

You can filter the visible tasks to show only those with certain labels. Labels appear on cards as colored dots.

You can add one or more labels to a task card.

Do one of the following actions.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
</table>
| Add a label to a card from the quick panel | 1. Drag a label from the quick panel directly to a task card.  
2. Drop the label in the drop zone. |
| Add a label to a card from the card details | 1. Open the card details for a task.  
2. Click the details tab (i).  
3. Under Labels, select one or more labels. Point to a label to display its name.  
4. Close the card detail pop-up window. |

You can use configuration options to *rename or disable* labels or to *hide* labels altogether.
Assign a task card to a user

Assignees represent ownership of task cards and the associated records. Each task card can have one primary assignee and multiple additional assignees.

You can filter the visible tasks on a board to show only tasks assigned to a certain user. Assignees appear on cards as avatars.

![Task card assignees](image)

Figure 711: Task card assignees

When a card changes lanes, all the assignees receive an email notification.

For flexible and guided boards, the primary assignee corresponds to the underlying task's Assigned to field. For example, on a board created from the Incident table, if you add Joe Employee as the primary assignee for a card, the associated incident is assigned to Joe. Note that assignment rules on the associated table may restrict who you can make the primary assignee of a card. If you attempt to assign a task card to a user in a way that violates an assignment rule, a notification appears and the assignment does not take place.
**Note:** Assignees are not automatically granted access to the board. Only members can access the board.

Do one of the following actions.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add an assignee from the quick panel</td>
<td>1. Drag a user’s avatar from the quick panel directly to the task card.</td>
</tr>
<tr>
<td></td>
<td>2. Drop the avatar in the Primary or Additional drop zone.</td>
</tr>
<tr>
<td>Add an assignee from the card details</td>
<td>1. Open the card details for a task.</td>
</tr>
<tr>
<td></td>
<td>2. Click the assignees tab (👤).</td>
</tr>
<tr>
<td></td>
<td>3. Click Add Primary Assignee or Add Additional Assignee. The Add Primary Assignee option is not available if there is already a primary assignee.</td>
</tr>
<tr>
<td></td>
<td>4. Select a user.</td>
</tr>
<tr>
<td></td>
<td>5. Close the card detail pop-up window.</td>
</tr>
</tbody>
</table>

The system sends an email notification to inform the new assignee of the change.

**Visual Task Board checklists**

Checklists help you track the progress of tasks on your Visual Task Board.

Checklists are available as a tab in the card details.
Figure 712: Sample checklist

You can add, remove, or rearrange checklist items. You can also save a checklist as a template for future use on other cards. Any user can create or edit a checklist. When the compact card view is disabled, the task card displays a progress bar to show how many items are complete.
You can also use checklists with task records in the standard interface. For more information, see \textit{Checklists}.

\textbf{Create a checklist for a card}

You can create a unique checklist for each Visual Task Board card or create a task from a checklist item.

Role required: none

1. Open the card details for a task.
2. Click the checklist tab (\text{\includegraphics[width=7pt]{checklist}}).
3. Click Add Item.
4. Enter text for the checklist item.
5. Press the Enter key to add the checklist item.
6. Create as many additional checklist items as desired.
7. To delete a checklist item, click the minus (-) icon.
8. To reorder checklist items, click the drag icon (\text{\includegraphics[width=7pt]{drag}}) and drag a checklist item to a different position in the list.
9. To create a task from a checklist item:
   a) Point to a checklist item and click the create task icon (\text{\includegraphics[width=7pt]{create}}).
b) Select the type of task you want to create.
   An administrator can configure which task types are available.
   The new task record appears in a pop-up window. The short description is automatically populated with the checklist item text.

c) Fill in the form with additional detail as necessary.

d) Click Update.

Create checklist template
A template saves time by creating checklist items automatically. You can add, edit, or remove checklist items without impacting the template.

Role required: none

1. Open the card details for a task.
2. Click the checklist tab (✓).
3. Add items to the checklist that you want to save as part of the template.
4. Click the more icon (⋮).
   The more icon does not display unless you have added an item to the checklist, or if you have a pre-existing checklist template.
5. Select Save as Template.
6. In the dialog box, enter a descriptive template name to identify the checklist.
   When a user creates a checklist from a template, all templates are listed in alphabetical order and there is no way to filter which templates appear. To provide a better user experience, consider implementing a naming system for checklist templates. For example, include the name of the table or another identifier to clarify how the checklist should be used.
7. Click Save.

Create a checklist from a checklist template by selecting the template from the more icon.

Delete a checklist from a card
You can remove a checklist from a Visual Task Board card.

Role required: none

1. Open a task card that contains a checklist.
2. Click the checklist tab (✓).
3. Click the more icon (⋮).
4. Select Remove Checklist.
   A confirmation dialog box appears.
5. Click Delete.

Configure which types of tasks can be created from checklist items
A system property controls which types of tasks you can create from a Visual Task Board checklist item.

Role required: admin

You might want to add custom tables or remove tables you do not use.

1. Navigate to sys_properties.list.
2. Locate the glide.ui.create_task_type_option_list property.
3. Edit the Value to add or remove tables.

You can add any table that extends Task [task]. Use the table name, not the label. For example, you would enter change_request, not Change Request. Ensure the tables listed are separated by commas, with no spaces.

The property value populates the task type selection list users choose from when they create a task from a checklist item. Note that users can only see task types for which they have the appropriate access roles.

---

**Archive a card**

Archiving a card is a non-destructive way to remove a card from a freeform board. You can archive cards you are no longer working on to reduce visual clutter.

Role required: none

---

**Note:** You can only archive cards on a freeform board.

- Perform one of the following actions.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Archive one card from the lane view</td>
<td>1. Point to a card and click the X icon that appears in the corner.</td>
</tr>
<tr>
<td></td>
<td>2. In the confirmation dialog, click Archive.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Archive one card from the card details</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Click a card and view the Details tab.</td>
<td></td>
</tr>
<tr>
<td>2. Under Tools, click Archive.</td>
<td></td>
</tr>
<tr>
<td>3. In the confirmation dialog, click Confirm.</td>
<td></td>
</tr>
</tbody>
</table>
### Archive all the cards in a lane

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Archive all the cards in a lane**   | 1. In the lane header, click the more options icon ( ).  
                                           2. Select Archive All Tasks.  
                                           3. In the confirmation dialog, click Archive.                                                                                     |

- To see all archived cards for the current board, from the board navigation panel, open the board information menu ( ) and click View Archived Tasks.
- To restore an archived card, point to it and click Restore.

### Access a task record from a VTB card

You can open the form view of any task card. Viewing a task record on a form allows you to see all fields for that record, including fields that are not visible in the card details.

**Role required:** none

Access a task record using one of the following options.
- Access the record from the task card by clicking the record number on the task card.
- Access the record from the card details by doing the following:
  a) Open the card details for a task.  
  b) Click the record number in the header.

### Move a card to a different lane

You can move a card from one lane to another.

**Role required:** none

When you move a card to a different lane on a guided board, the field on which the lanes are based is updated to reflect the new lane value.

1. Open a Visual Task Board. 
2. Select a card and drag it to a different lane.  
   - To cancel the move, press the Escape key while you drag the card.

**Note:** All mandatory fields on a record must be filled in to move the associated card to a new lane. For example, assume you have a guided board based on the Incident [incident] table, with a lane for each State. The Close code and Close notes fields become mandatory when the State changes to Closed. If you attempt to move an incident card from the New lane to the Closed lane, a pop-up view of the form appears and prompts you to fill in the mandatory fields.

### Move a card to a different board

You can move a card from one freeform board to another.

1. Open the card details.  
2. In the details tab ( ), click Move Card.
3. In the pop-up window that appears, select the board and lane to move the card to. The board selection list displays freeform boards only.

Task board tools

The task board tools area in a Visual Task Board contains several tabs, each represented by an icon. Click an icon to open the tab. Click the same icon again to hide the tab. The tabs you see for each conversation depend on the conversation type and other conditions.

<table>
<thead>
<tr>
<th>Tab icon</th>
<th>Tab name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>📌</td>
<td>Info</td>
<td>Contains the following information about the task board: • Name • Board type • Table name and a link to open the table view (visible on data driven boards only) • Filter conditions (visible on data driven boards only) • Lane field (visible to the board owner, on data driven boards only) • Owner • Number of lanes • Number of cards • URL</td>
</tr>
<tr>
<td>🧑‍ %=</td>
<td>Members</td>
<td>Lists all members and assignees of the board. You can add or remove board members, promote assignees to be members, and filter the board by member or assignee.</td>
</tr>
<tr>
<td>🐠</td>
<td>Labels</td>
<td>Use labels to visually distinguish tasks on the task board. Filter board contents by toggling the label. You need to <strong>enable labels</strong> before being able to use this tab.</td>
</tr>
<tr>
<td>🎃</td>
<td>Activity</td>
<td>Displays all of the activity for cards on the board.</td>
</tr>
<tr>
<td>Tab icon</td>
<td>Tab name</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Configuration</td>
<td>Configure the settings for the task board. This setting is only available for the board owner. For more information, see <em>Configure a task board</em> on page 3194</td>
</tr>
</tbody>
</table>

View board information

You can display key information about any task board.

Role required: none
Open a task board.
Click the board information icon (i).

Add a board as a favorite
Add boards you access frequently to the application navigator using the favorite option.
Role required: none
Adding a board as a favorite is only available in UI16.

1. Navigate to Self Service Visual Task Boards.
2. From the board you want to favorite, select the information icon from the board tools. Then select the star.
3. Remove the board as a favorite by clearing the star icon.

View a task board in a list

You can view a task board in the list view using the board information option.

Role required: none

1. Open a task board.

2. From the task board tools, click the board information icon (i).

3. Click View List at the bottom of the information panel.

   The cards from the board open in the list view.

   **Note:** The freeform board list view only shows cards made by the board and no other tasks that might be added manually.

Add or remove a task board member

You can add and remove task board members using the members tab of the activity stream. You can also promote assignees to board members.

Role required: none

Only members of a task board can access the board. Any board member can add or remove other members.

1. On a Visual Task Board, open the task board tools.

2. Click the members tab.

3. Perform one of the following actions.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Add a member</strong></td>
<td></td>
</tr>
<tr>
<td>1. In the Users section, click Add Members.</td>
<td></td>
</tr>
<tr>
<td>2. Enter a user's name or select a user from the drop-down menu.</td>
<td></td>
</tr>
</tbody>
</table>

   | Remove a member             |             |
   | 1. In the Members section, point to a user. |             |
   | 2. Click the dash icon (-). |             |

   | Promote an assignee to a member |             |
   | 1. In the Assignees section, point to a user. |             |
   | 2. Click the upward arrow icon. |             |

   | Promote all assignees to members | In the Assignees section, click Promote All. |
Visual Task Board SLA indicators

SLA (service level agreement) indicators alert board members if any cards on the board have breached SLAs.

When SLA indicators are enabled, a status bar appears on each card that has an associated SLA. If any cards have breached SLAs, an alert appears at the top of the board and a filter option appears in the quick panel. The indicator displays the elapsed percentage of the SLA. If there are multiple SLAs associated with a task card, the indicator displays the status of the SLA with the greatest elapsed percentage.
Figure 7: Visual Task Board with SLA indicators enabled

NEW
- SSL certification issue
  - SLA: 52%
- Trouble getting to Oregon mail server
  - Unassigned
- Can’t access SFA software
  - Unassigned

IN PROGRESS
- Please remove the latest hotfix from my PC
  - SLA: 21%
  - INC0000027
- Phishing scam?
  - TrustedBank™
  - Inc010002
  - About an hour ago
- Network storage unavailable
  - INC0000049

ON HOLD
- Unable to get to network file shares
  - User can’t get to any of his files on the file server.
  - SLA: 120.36%
  - INC0000002
- JavaScript error on hiring page of corporate website
  - INC0010002
  - 4d ago
Any board member can enable SLA indicators from the board configuration menu. The setting applies to the current user only.

**Share a Visual Task Board in a Connect conversation**

You can share a Visual Task Board in a Connect Chat or Connect Support conversation.

Role required: none

1. Navigate to **Self-Service Visual Task Boards**.
2. Drag a task board to a Connect mini window.

   A link to the task board appears in the conversation. The task board is also listed in the conversation tools, which are visible in the Connect workspace. Only conversation members who are members of the board can access it. If you share a task board in a *record conversation*, it appears as a URL in the record activity stream.

**Create a Connect conversation from a Visual Task Board**

Create a Connect Chat conversation from a Visual Task Board to collaborate with board members and keep track of activity as it happens.

Role required: none

When you create a conversation from a task board, all the board members become members of the conversation. The members are synchronized between the task board and the conversation. For example, if you remove a user from the conversation, the system automatically removes the user from the board as well.

1. Navigate to **Self-Service Visual Task Boards**.
2. Open a task board.
3. In the board header, click the connect with board members icon ( ).

   The system automatically opens a record conversation for the board. Each board member becomes a member of the conversation.

**Visual Task Board accessibility**

Several accessibility improvements are included in Visual Task Boards.

**Skip links**

Skip links allow you to tab directly to the main content on a page. When *accessibility mode is enabled*, task boards include a skip link to view tasks as a list. The View tasks as a list skip link switches all the task cards to the table view. For more information on viewing task boards in a list view, see **View a task board in a list** on page 3190.

**View card details**

With accessibility mode enabled, visual indicators appear on task cards that users can tab to in order to open card details. For more information, see **View card details in a task board** on page 3194.
View card details in a task board

With accessibility mode enabled, tab through cards in a task board. Use the card details button to view task card details.

Enable accessibility from the General tab of the system settings menu.

Role required: none

2. Open an existing task board.
3. Tab through the board to get to a task card.
4. Tab through the card until the Open Card Details button appears.

![Card details](image)

Figure 716: Card details

5. Press Enter to open the card.
6. To exit the card, press Escape.

Configure a task board

The board configuration menu provides several options that affect the look and feel of the board.

Role required: none
Task board setting changes are personal unless otherwise stated.

1. From the task board tools, click the menu icon ( ).
2. Click Advanced Settings, then from the Board Color section, select a background color from the palette.
   The background color surrounds the lane area of a board. It also appears as the color for the board on the My Task Boards page. Changes to the background color apply to all users.
3. In the Quick Panel section, toggle quick panel options as necessary.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Show Panel</td>
<td>Shows the quick panel is visible. This setting applies to the current user only.</td>
</tr>
<tr>
<td>User Names</td>
<td>When enabled, user names appear by user avatars in the quick panel. This setting applies to the current user only.</td>
</tr>
<tr>
<td>Show Labels</td>
<td>When enabled, labels appear on cards and in the quick panel. This setting applies to all users.</td>
</tr>
<tr>
<td>Label Names</td>
<td>When enabled, the label name appears beside the colored icon for that label in the quick panel. This setting applies to the current user only and is available only when Show Labels is enabled.</td>
</tr>
</tbody>
</table>

When all the options are enabled, a quick panel looks like this:

![Quick panel](image)

4. In the Configure Cards section, toggle card options as necessary.
   Changes to the cards apply to the current user only.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact Cards</td>
<td>Decreases the lane width and card information and thumbnails do not appear on the card.</td>
</tr>
<tr>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Show Card Info</td>
<td>Card information that appears on each card. Card information typically includes details like the task state, date opened, and last user to update it. This setting is available only when Compact Cards is disabled.</td>
</tr>
<tr>
<td>Show Card Attachment</td>
<td>Cards display the first image attached to that card as a thumbnail. This setting is available only when Compact Cards is disabled.</td>
</tr>
<tr>
<td>Show SLAs</td>
<td>SLA status indicators appear on cards and alerts appear when one or more card has a breached SLA. SLA status indicators are hidden when Compact Cards is enabled. This setting is available only when there are SLAs associated with the tasks on the board.</td>
</tr>
</tbody>
</table>

5. Under Advanced Settings, in the Lane Configuration section, show or hide lanes by selecting or clearing the check box for each lane. Rearrange lanes by dragging and dropping them in the list.

Configuring Visual Task Board labels

Labels help categorize tasks and visually distinguish them on the task board. You can disable or rename labels using the labels tab of the activity stream.

Role required: none

You can use up to seven labels per board. Any board member can edit the labels on a board.

1. From the task board tools, click the labels tab.
2. Click the labels tab.
3. Toggle the Show Labels switch to the enabled position if it is not already enabled.
4. To change a label name, click the label text and enter a new value.
5. To disable or enable a specific label, toggle the switch by the label.

When a label is disabled, members cannot add that label to cards on the board. The label is hidden on cards that are already labeled.

Modify the query or lane field for an existing board

For flexible and guided boards, you can edit the board query or lane field. This ability enables you to change the board contents while preserving the member list, board configuration settings, and, if applicable, Connect Chat conversation history.
Inform the board members that you plan to change the board query or lane field. If you or any members have manually sorted cards within a lane, the order may be reset.

Role required: none but you must be the board owner

The board query consists of filter conditions that determine which tasks the board tracks. For example, you might edit the query so the board shows only active incidents, rather than all incidents.

The lane field is the field on the underlying table that defines the lanes. For example, you might change the lane field so the lanes represent incident states, rather than assignees. This change is called a lane field pivot. Lane field pivots also make it possible to convert a flexible board to a guided board or vice versa.

1. Open a task board.
2. Click the board information icon (i) by the board name.
3. Perform one of the following actions.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
</table>
| Edit the board query    | 1. Under Board Filter, click Edit Filter to open the condition builder.  
                            2. Add and remove conditions as needed to edit the query.  
                            3. Click Save. |
| Change the lane field   | 1. Click the Lane Field picker and select a field or the None option.  
                            Guided boards have the Lane Field set to a field, such as State. Flexible boards have the Lane Field set to None. You can change the Lane Field value accordingly to change the board type.  
                            2. In the confirmation dialog, click OK. |

The board reloads to reflect the changes.

Configure the card limit for freeform boards

Freeform boards can display up to 2,000 cards by default. You can change the default card limit by adding a property.

Role required: admin

1. Add a new system property with the following field values.

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>glide.vtb.freeform_max</td>
</tr>
<tr>
<td>Type</td>
<td>integer</td>
</tr>
</tbody>
</table>

2. Set the Value to the maximum number of cards allowed for each freeform board.
Configure the card limit for flexible and guided boards

Flexible and guided boards can display up to 2,000 cards by default. You can change the default card limit by adding a property.

Role required: admin

1. **Add a new system property** with the following field values.

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>glide.vtb.board_max</td>
</tr>
<tr>
<td>Type</td>
<td>integer</td>
</tr>
</tbody>
</table>

2. Set the Value to the maximum number of cards allowed for each flexible or guided board.

   *Note: Performance degradation may occur if you set the Value to a number greater than 1,000, especially on tablet devices.*

Configure the task board card view

Configure the fields that appear in a card on a task board.

Role required: admin

1. Navigate to the form you want to configure fields for.
2. Right-click the header and select Configure Form Layout.
3. Under the Form View section, select the VTB view.

   You may need to create a VTB view for the form. For more information, see *Create and delete views.*
4. Select the fields to appear on the card by adding or removing the fields from the Selected column. You can also adjust the order they appear on the form by moving the fields up or down.

Workflow

Workflow provides a drag-and-drop interface for automating multi-step processes across the platform. Each workflow consists of a sequence of activities, such as generating records, notifying users of pending approvals, or running scripts. The graphical Workflow Editor represents workflows visually as a type of flowchart. It shows activities as boxes labeled with information about that activity and transitions from one activity to the next as lines connecting the boxes.

**Explore**

- Upgrade to London
- Workflow movement with update sets on page 3337
- Workflow activity pinning on page 3471

**Set up**

- Getting started with workflows on page 3199

**Administer**

- Workflow roles on page 3329
- Administering workflow contexts on page 3329

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Getting started with workflows

The graphical Workflow Editor provides a drag-and-drop interface for automating multi-step processes across the platform.

Each workflow consists of a sequence of activities, such as generating records, notifying users of pending approvals, or running scripts.

The workflow starts when a triggering event occurs. Common triggers include a record being inserted into a specific table, or a particular field in a table being set to a specified value. For example, you might create a workflow that runs whenever a user requests approval for an item they want to order from the catalog.

When an activity completes, the workflow transitions to next activity. An activity might have several different possible transitions to various activities, depending on the outcome of the activity. Continuing the example above, if the user's request is approved, the activity might transition to an activity that notifies someone to order the item; if the user's request is denied, the activity might transition to notifying the user that their request has been denied.

The graphical Workflow Editor represents workflows visually as a type of flowchart. It shows activities as boxes labelled with information about that activity and transitions from one activity to the next as lines connecting the boxes.

At each step in a workflow:

1. An activity is processed and an action defined by that activity occurs.
2. At the completion of an action by an activity, the workflow checks the activity's conditions.
3. For each matching condition, the workflow follows the transition to the next activity.

When the workflow runs out of activities, the workflow is complete.

Workflow activities

A workflow activity contains instructions that are processed by the workflow.

Activities can include running scripts, manipulating records, waiting for a set period of time, or logging an event. Workflow conditions determine whether or not the activity is performed. Activities can be added, removed, or rearranged. Transitions can be drawn between activities.

This is an activity that triggers a notification:
Figure 717: Sample activity

For more information on available activities and their behaviors, see *Workflow activities* on page 3367.

**Transitions**

After the workflow condition is evaluated, the workflow transition determines which activity is performed when the workflow condition is met.

This is a transition that always leads from the Change Approved script to the Change Task activity:

Figure 718: Sample transition

**Exit conditions**

After a workflow activity is performed, the workflow condition is evaluated to determine which transition is activated.

The condition determines behavior based on a change being approved or rejected:
Workflow example

During workflow editing or while an unpublished workflow is running, only the person who checked out the workflow can view the changes.

After a workflow is published, it is available to other users. The workflow moves through the process as defined in the Workflow Editor. The entire workflow is represented in one screen. For example, this is the Standard Change workflow:
Figure 720: Sample change workflow

Workflow editor

The Workflow Editor is an interface for creating and modifying workflows by arranging and connecting activities to drive processes.

You can manage multiple workflows in the same screen, create custom workflow activities, and use existing activities as data sources. Users with the workflow_creator role can create workflows. Users with the workflow_admin role can create, modify, delete, and publish workflows.

To open the Workflow Editor, navigate to Workflow Workflow Editor. For information about using the editor, see Create a workflow on page 3222.
Welcome screen

The editor opens with the Welcome page, which displays a list of active, published workflows. From this tab, you can open existing workflows, create new workflows, and open help resources related to workflow.
Click to create a new workflow

New

Workflows: Workflow activities and workflows you can use as subflows.
Core: Available workflow activities appropriate for the selected workflow. Contents can include activities provided by the base system and those purchased with orchestration.
Packs: Orchestration activity packs downloaded from the ServiceNow® App Store, organized by vendor and scope. Custom activities and workflows that you scope also appear as packs. Only visible if the orchestration plugin is installed.
Custom: Orchestration custom activities available. Only visible if the orchestration plugin is installed.
Data: Activities in the current workflow that output data. You can use these activities as data sources for other activities. Only visible if the orchestration plugin is installed.

Note: If your workflow welcome page does not look like this example, you may have customized the workflow welcome page before upgrading to London. You can update the workflow welcome page to the latest version by editing the UI pages.

Navigate to System UI UI Pages Workflow Editor welcome. In the UI page record for workflow_editor_welcome, scroll to the Versions related list. Select the row for the version corresponding to the upgrade to London, right-click and select Revert to this version.

Workflow canvas

After you open or create a new workflow, the system displays the workflow canvas. On the canvas you interact with the Workflow Editor through several different elements: the canvas itself, the canvas tabs, the title bar, the palette, and the palette tabs.

The drawing canvas is where you add activities and configure transitions for checked out workflows. Add an activity by dragging it from the palette to the workflow in the canvas. For more information, see Create a workflow on page 3222.

- Canvas tabs: Contains tabs for accessing workflows being edited or created.
- Title bar: Displays the workflow name and status. Provides a menu and controls for configuring, testing, and validating workflows.
- Canvas: Provides the working surface for creating new workflows or editing existing ones.
- Palette tabs: Contains tabs for accessing activities being edited or created.
- Palette: Contains all available workflow activities and existing workflows you can use as subflows. Drag activities and subflows to the canvas to create new workflows or edit existing ones.
The default workflow palette contains workflow activities and existing workflows you can use as subflows. The basic workflow palette contains these tabs:

- **Workflows**: Displays existing workflows and provides controls for creating new ones.
- **Core**: Displays baseline workflow activities available to all systems and Orchestration activities (when Orchestration is activated).
Workflows tab

The Workflows tab lists existing workflows that you can edit or use as subflows in other workflows. Double-click a workflow to open it in the canvas. To add a workflow as a subflow, drag it to another workflow in the canvas. Click the + icon to create a new workflow.

Core tab

The Core tab contains the standard activities available by default to all workflows and any activities purchased with Orchestration, organized by category. Click the arrow icons to expand or collapse the activity lists under each category. To add an activity to a workflow, drag it to the canvas. For more information, see Add an activity to a workflow on page 3456.
Workflow editor title bar

When a workflow is opened in the canvas, the title bar displays the workflow title and the workflow status in italics. Possible states are Checked out by <name> and Published.
Figure 724: Workflow editor title bar

Controls on the right side of the title bar manage the workflow.

- **Workflow Properties**: Opens the current workflow's properties form.
- **Start**: Runs the workflow. This control is only available for workflows running on the Global table that are accessible from all application scopes. To test workflows that are on other tables, insert a record into that table that meets the condition of the workflow.
- **Validate**: Tests the workflow prior to publication. Validation detects potential problems that can prevent the workflow from publishing or cause the workflow to fail. For more information, see *Workflow Validation*.
- **Help**: Opens documentation to help you create the workflow.

**Workflow menu**

Click the menu icon in the title bar for additional options to configure the workflow.
Figure 725: Accessing the workflow menu

These menu options are available:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Workflow</td>
<td>Creates a new workflow.</td>
</tr>
<tr>
<td>Open Existing</td>
<td>Opens another existing workflow.</td>
</tr>
<tr>
<td>Copy</td>
<td>Creates a duplicate of the workflow. Give the copy a different name.</td>
</tr>
<tr>
<td>Publish</td>
<td>Makes the personal workflow version public, overwriting the current published workflow version. This option is only available for checked out workflows.</td>
</tr>
<tr>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Checkout</td>
<td>Creates a personal version of the workflow for you, which you can edit. This option is only available for published workflows.</td>
</tr>
<tr>
<td>Delete</td>
<td>Deletes the workflow. You cannot delete workflows that have contexts associated with them.</td>
</tr>
<tr>
<td>Set Inactive</td>
<td>Inactivates the workflow so that it cannot be used.</td>
</tr>
<tr>
<td>Expand Transitions</td>
<td>Redraws the transitions so that they do not overlap when they leave the activity condition.</td>
</tr>
<tr>
<td>Start Workflow</td>
<td>Starts a test run of the current workflow.</td>
</tr>
<tr>
<td>Validate Workflow</td>
<td>Runs validation tests on your workflow prior to publication. Use this validation to detect potential problems that can prevent the workflow from publishing or cause the workflow to fail. For more information, see Work on workflows on page 3236.</td>
</tr>
<tr>
<td>Collapse Transitions</td>
<td>Redraws the transitions so they overlap when they leave the activity condition.</td>
</tr>
<tr>
<td>Show Contexts</td>
<td>Displays all the contexts for the current workflow. You can use this option to troubleshoot a workflow.</td>
</tr>
<tr>
<td>Properties</td>
<td>Opens the Workflow Properties form, which defines the workflow's attributes.</td>
</tr>
<tr>
<td>Edit Inputs</td>
<td>Opens the Workflow Inputs list of variables that the workflow can accept when used as a subflow. For more information, see Pass a variable from a workflow to a subflow on page 3243.</td>
</tr>
<tr>
<td>Edit Stages</td>
<td>Opens the Workflow Stages list. For more information, see Workflow stages on page 3273. For tables with a column of Type = Workflow.</td>
</tr>
</tbody>
</table>

**Workflow editor keyboard navigation**

The platform includes accessibility features that support [Web Content Accessibility Guidelines (WCAG) 2.0 level A](https://www.w3.org/WAI/standards-guidelines/wcag/) and make the interface accessible to users with disabilities.

These features improve the user experience when accessing platform functions with screen readers and keyboard navigation. In general, you use the following set of standard keyboard navigation functions:

- Press Tab to navigate major groupings in a pre-defined sequence. This usually includes moving between standard interface controls (fields and lists) in a module, or between records within a tab.
  - Press Shift Tab to move backwards in a pre-defined sequence.
- Use arrow keys (left, right, up, down) to navigate between individual elements within a group. This usually includes moving between tabs, or between available selections within a specific control (for example, within a list).
• Press Enter to select a control or tab, or enter text within a control.

The Workflow Editor is constructed in a unique manner. It includes a series of main (left) panel tabs, a series of side (right) panel tabs, and a drawing canvas for workflow creation or editing. As such, it has its own unique set of keyboard accessibility functions and commands.

Welcome page keyboard commands

Use keyboard commands to navigate and operate the Workflow Editor Welcome page.
<table>
<thead>
<tr>
<th>Task or Action</th>
<th>Keyboard Commands</th>
</tr>
</thead>
</table>
| Navigate to main content (left) panel, and select a workflow | 1. After accessing the Workflow Editor from a menu, press Tab. 
   
   **Skip to Main Content**

   appears in the upper left corner.

   2. Press Enter to position the cursor in the first record displayed in the Published tab.

   3. Press Tab to navigate down the listing of workflow records.

   Press Enter to select and open a workflow record in the Workflow drawing canvas. |

| Select a checked out workflow or a help function in main content panel | 1. After accessing the Workflow Editor from a menu, press Tab until the Published tab is highlighted.

   **Note:** Do not select or .

   2. Press the right or left arrow keys to navigate between the Published, Checked Out, or Help tabs.

   3. Press Tab to navigate across the columns and down the listing of checked out workflow records or help selections.

   Press Enter to select and open a checked out workflow record in the Workflow drawing canvas, or open a help selection (work or orchestration videos, documentation, community discussions, knowledge base, or live feed). |

| Create a workflow | 1. After accessing the Workflow Editor from a menu, press Tab until **New Workflow** is highlighted.

   2. Press Enter to open **New Workflow** |
<table>
<thead>
<tr>
<th>Task or Action</th>
<th>Keyboard Commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jump to Top</td>
<td>After tabbing through the displayed records in a tab in the main panel (for example, within the Published tab), a “Jump to top” button appears at the bottom of the listing. Press Enter to return to the Welcome tab at the top of the Workflow Editor.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Navigate to page selection controls | 1. After tabbing through the displayed records in a tab in the main panel (for example, within the Published tab), including press Tab to access the page selection controls. Continue to press Tab until you access the desired one.  

2. Press Enter to operate the selected page control. |
<table>
<thead>
<tr>
<th>Task or Action</th>
<th>Keyboard Commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Navigate directly to side (right) panel to open help, create a new workflow, or open an existing one</td>
<td>1. After accessing the Workflow Editor from a menu, press Tab two times. Do not select appears in the upper left corner.</td>
</tr>
<tr>
<td></td>
<td>2. Press Enter to position the cursor in the Workflows tab in the side panel.</td>
</tr>
<tr>
<td></td>
<td>3. To open help, press Tab to navigate to Press Enter to open help, or press Tab to skip.</td>
</tr>
<tr>
<td></td>
<td>4. To create a new workflow, press Tab to navigate to Press Enter to open New Workflow, or press Tab to skip.</td>
</tr>
<tr>
<td></td>
<td>5. To open an existing workflow:</td>
</tr>
<tr>
<td></td>
<td>• As needed, stop at the filter field to filter workflows.</td>
</tr>
<tr>
<td></td>
<td>• Press Tab to navigate down the workflow list.</td>
</tr>
<tr>
<td></td>
<td>• Press Enter to select and open a workflow record in the Workflow drawing canvas,</td>
</tr>
<tr>
<td>Task or Action</td>
<td>Keyboard Commands</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Add a core activity to a checked out workflow in the Workflow drawing canvas</td>
<td>If a checked out workflow is open in the Workflow drawing canvas, core activity records display in the Core tab. To select a core activity and place it in the checked out workflow:</td>
</tr>
</tbody>
</table>

**Note:** Core activity records only display when a checked out workflow is open in the Workflow drawing canvas. Other tabs display in the side panel only if Orchestration functions are enabled.

1. In the Workflow drawing canvas, press Shift Tab until appears in the upper left corner.
2. Press Enter to position the cursor in the Workflows tab in the side panel.
3. Press the right arrow key to navigate to the Core tab.
4. Press Tab or the down arrow key to navigate down the listing of core activities.
   - To open a core activities folder (for example, Approvals), press the right arrow key.
   - To navigate up the list, press the left or up arrow keys.
5. Press Tab to select a core activity and open the New Activity dialog to specify properties for it.
6. After creating the activity, remember to link it to another activity in the workflow. See Create a connection from a condition on one activity to the next activity that follows in *Workflow drawing canvas keyboard commands* on page 3217.

---

**Workflow drawing canvas keyboard commands**

Use keyboard commands to navigate and operate the Workflow Editor canvas.
### Task or Action
Select Workflow Actions menu command (for example, Validate Workflow or Publish Workflow)

### Keyboard Commands
1. Press Tab until the context menu is highlighted.
2. Press Enter to open the context menu.
3. Use the down arrow key to move to the command, then press Enter to select it.
<table>
<thead>
<tr>
<th>Task or Action</th>
<th>Keyboard Commands</th>
</tr>
</thead>
</table>
| Set general workflow properties             | 1. Press Tab until 

is highlighted.  

2. Press Enter to open Workflow Properties. |

| Navigate from activity box to activity box. | Simply press Tab or use the arrow keys (right, left, up and down) to navigate from activity to activity within the workflow. |

**Note:** Depending on the complexity and number of activity boxes in the workflow, the sequence of navigation is not always predictable. Depending on how you are navigating within the workflow, the navigation sequence is generally (but not always) row-by-row, and focus is usually placed on the nearest activity box.
<table>
<thead>
<tr>
<th>Task or Action</th>
<th>Keyboard Commands</th>
</tr>
</thead>
</table>
| Modify a selected activity.    | 1. Navigate to the activity box, then press Enter to select it and place it in Edit mode. When you select an activity box, it appears as highlighted.  
2. Once in Edit mode, use Tab to move around within the activity box to change or access elements such as:  
   • Activity Properties  
     - Title  
     - Node context menu  
     - Delete Node  
     - Condition Properties  
   • Condition Properties  
     - Condition Properties  
     - Node conditional context menu  
     - Node conditional port options  
   3. Press Enter to select an element, or press Esc to escape an element without making changes. |
| Add a condition to an activity. | 1. Within an activity box, select Always to access Condition Properties.  
2. In Condition Properties, specify the conditions for the activity. |
<table>
<thead>
<tr>
<th>Task or Action</th>
<th>Keyboard Commands</th>
</tr>
</thead>
</table>
| Create a connection from a condition on one activity to the next activity that follows | 1. Within an activity box, select Node conditional context menu.  
2. Select Link to... to create a connection to the next activity box that follows, or select Delete to delete an existing connection.                                                                                                                                                                                                                                        |
| Add a core or custom activity                                                 | 1. Within an activity box, select Node conditional port options.  
2. Select Add Core Activity to access Workflow Activity Definitions to add a new core activity, or select Add Custom Activity to add a custom activity to the workflow.                                                                                                                                                                                                                     |
| Move an activity box                                                          | 1. Press Tab to navigate to the activity box, enter press Enter to select it.  
2. Use the arrow keys to move the activity box. To move the activity box one pixel at a time, press Shift while using the arrow keys.                                                                                                                                                                                                                  |
| Validate a workflow                                                           | 1. Press Tab until ✔️ is highlighted.  
2. Press Enter to validate the workflow.  
You can also select Validate from the Workflow Actions menu.                                                                                                                                                                                                                                                                                            |
| Run a workflow                                                                | 1. Press Tab until ⏯️ is highlighted.  
2. Press Enter to run the workflow.                                                                                                                                                                                                                                                                                                                                                          |

**Note:** If the workflow is tied to a database table, this function is disabled. The workflow runs when the proper table conditions are activated (for example, insertion of a new record into the table).
<table>
<thead>
<tr>
<th>Task or Action</th>
<th>Keyboard Commands</th>
</tr>
</thead>
</table>
| Close workflow drawing canvas | 1. Press Tab until (on the right side of the tab that contains the name of the workflow) appears.  
2. Press Enter to close the canvas. |
| Publish a workflow          | 1. Press Tab until the context menu is highlighted.  
2. Press Enter to open the context menu.  
3. Use the down arrow key to move to the Publish command, then press Enter to select it. |
| Jump to Top                 | After tabbing through the entire workflow, appears at the bottom of the listing. Press Enter to jump to the top of the Workflow drawing canvas. |

**Workflow management**

Create, edit, validate, and publish workflows to automate multi-step processes across the platform. Understand workflow activities and variables and how to use them effectively. Take a deeper look at how workflows are constructed, validated, and used.

**Create a workflow**

Automate a multi-step process by creating a workflow with the Workflow Editor.

- You must have the workflow_admin or workflow_creator role to use the Workflow Editor.
- If you are designing the workflow as part of an update set process, see *Workflow movement with update sets* on page 3337 before creating the workflow.

1. Navigate to Workflow Workflow Editor.  
The Welcome tab of the Workflow Editor opens.  
2. On the Workflows tab in the palette, click New Workflow.
<table>
<thead>
<tr>
<th>Workflow Name</th>
<th>Type</th>
<th>Description</th>
<th>Created Date</th>
<th>Created Time</th>
<th>Updated Date</th>
<th>Updated Time</th>
<th>Published</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Catalog Item Request</td>
<td>Requested Item</td>
<td>gsku.maint</td>
<td>2009-11-14</td>
<td>08:46:52</td>
<td></td>
<td></td>
<td>true</td>
<td>Global</td>
</tr>
<tr>
<td>Knowledge - Instant Publish</td>
<td>Knowledge</td>
<td>admin</td>
<td>2014-11-05</td>
<td>01:02:23</td>
<td></td>
<td></td>
<td>true</td>
<td>Global</td>
</tr>
<tr>
<td>Grant role_delegator role to user in group</td>
<td>Change Request</td>
<td>jennex.paladino</td>
<td>2010-02-25</td>
<td>13:32:49</td>
<td></td>
<td></td>
<td>true</td>
<td>Global</td>
</tr>
<tr>
<td>Item Designer - Approvals</td>
<td>Requested Item</td>
<td>negel.beh</td>
<td>2014-02-24</td>
<td>16:03:13</td>
<td></td>
<td></td>
<td>true</td>
<td>Global</td>
</tr>
<tr>
<td>Paid Reset - Master</td>
<td>Global [global]</td>
<td>changilia</td>
<td>2015-09-23</td>
<td>08:05:34</td>
<td></td>
<td></td>
<td>true</td>
<td>Global</td>
</tr>
<tr>
<td>Change Request - Emergency</td>
<td>Change Request</td>
<td>admin</td>
<td>2013-08-21</td>
<td>07:37:46</td>
<td></td>
<td></td>
<td>true</td>
<td>Global</td>
</tr>
<tr>
<td>Default SLA workflow</td>
<td>Task SLA [task_char]</td>
<td>admin</td>
<td>2015-09-21</td>
<td>07:37:38</td>
<td>true</td>
<td>Global</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change Request - Normal</td>
<td>Change Request</td>
<td>admin</td>
<td>2015-09-21</td>
<td>07:37:38</td>
<td></td>
<td></td>
<td>true</td>
<td>Global</td>
</tr>
<tr>
<td>Item Designer</td>
<td>Requested Item</td>
<td>negel.beh</td>
<td>2011-03-04</td>
<td></td>
<td></td>
<td></td>
<td>true</td>
<td>Global</td>
</tr>
</tbody>
</table>
A simplified version of the New Workflow form opens.

3. Fill in the Name and Table fields

4. [Optional] Add a Description.

5. [Optional] Do one of the following:
   a) If the Conditions UI section is displayed, specify a Condition if needed and edit the fields.
   (The Conditions UI section shows only if the selected table supports conditions for launching workflows. For example, if you select the sc_req_item table, conditions are not applicable and the Conditions UI section is not displayed.)
   b) If the Stages UI section is displayed, check that the State rendering and Stage order fields contain the correct information. (The Stages UI section shows only if the selected table supports stages. For example, if you select the sc_req_item table, the Stages UI section is displayed.)

6. Click Submit.

   The new workflow is created with the Begin and End activities connected by a single transition.

7. Finish creating the workflow by adding activities, validating, and publishing so the workflow is available to other users.
   For more information, see Work on workflows on page 3236.

8. To change advanced settings for the workflow, click the Properties icon ⚙️. If you make changes, click Update.

Workflow properties

In the properties of a workflow, you can configure settings such as its application scope, start conditions, schedule, inputs, stages, and run time metrics. You can also view information such as the workflow author, version, and history.

When you create a new workflow, the following fields are available in the dialog box:

- Name
- Table
- Description
- If condition matches
- Condition

If you click Diagrammer view, in Related Lists, the following UI sections are available in the dialog box:

- General
• Conditions
• Inputs
• Activities
• Application
• Schedule
• Stages
• Estimated Runtime

General

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>A name to identify the workflow.</td>
</tr>
<tr>
<td>Table</td>
<td>The table for the workflow to run on. Workflows that run on specific tables can still interact with other tables. Select Global [global] to run the workflow on all tables.</td>
</tr>
<tr>
<td>Checked out</td>
<td>[Read-only] When the workflow was checked out. Automatically set by the Checkout action in the workflow menu.</td>
</tr>
<tr>
<td>Checked out by</td>
<td>[Read-only] The user who has this workflow checked out. This value is automatically set by the Checkout action in the workflow menu.</td>
</tr>
<tr>
<td>Published</td>
<td>[Read-only] Check box to indicate whether the workflow has been published. Automatically set by the Publish action in the workflow menu.</td>
</tr>
<tr>
<td>Description</td>
<td>The purpose of the workflow.</td>
</tr>
</tbody>
</table>

Conditions

Create conditions to trigger the workflow. The Conditions section does not appear if you select a table, such as sc_req_item, that does not require a condition.
### If condition matches

When the condition evaluates to true, the workflow launches an active context:

- **None**: The workflow is not automatically started by the workflow engine. To run this workflow, write a script to start the workflow.
- **Run the Workflow**: The default value. The workflow engine starts the workflow if the information in the Condition field matches a record that is inserting into the table.
- **Run if no other workflows match yet** (deprecated): The workflow only runs if no other workflows are running on the execution thread that started this workflow. Avoid using.
- **Run if no other workflows matched**: The workflow only runs if no other workflows are running on a specific record. For example, there are four workflows inserted into the Incident table, which have a condition such as `short_desc contains test`. A new workflow, which has If condition matches set to Run if no other workflows match yet, only runs if none of the four workflows have started running on the Incident record.

### Condition

A condition builder for specifying workflow conditions that trigger the behavior selected from the If condition matches list.

### Order

Numeric value that determines the order of the workflow, relative to other workflows. Workflows are evaluated in order from the lowest order number to the highest. A workflow runs if it is the first to match conditions.

### Inputs

The Inputs section lists all the activities in the current workflow that input data, the data type, and the default value. The Inputs section is only available after a workflow has been created. To create a variable, click New.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Label</td>
<td>Displayed column label. Localized depending on user locale.</td>
</tr>
<tr>
<td>Reference</td>
<td>Input field from another table.</td>
</tr>
<tr>
<td>Type</td>
<td>Data type. For example, integer or string.</td>
</tr>
<tr>
<td>Default value</td>
<td>Value used if you do not provide a value.</td>
</tr>
</tbody>
</table>
Activities

The Activities section enables you to set activity pinning and maximum activity count.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity pinning</td>
<td>List of options that control updates to custom activities at the workflow level. Pinning protects custom activities from being updated automatically when downloaded from the ServiceNow Store. For more information, see Workflow activity pinning on page 3471. The possible options are:</td>
</tr>
<tr>
<td></td>
<td>• Set by activity: Allows all activities in the workflow to use their own pinning settings. This is the default pinning option.</td>
</tr>
<tr>
<td></td>
<td>• Pin all activities: Pins all activities in the workflow to their current version.</td>
</tr>
<tr>
<td></td>
<td>• Unpin all activities: Allows all activities in the workflow to be updated.</td>
</tr>
<tr>
<td>Max activity count</td>
<td>The maximum number of activities performed by the workflow. This value is used to prevent infinite loops and is set to 100 by default. When the stated maximum count is reached, the workflow is canceled. If this field is blank, the maximum count is set to -1, and the workflow is canceled.</td>
</tr>
</tbody>
</table>

Application

The Application section enables you to see application scope and scope restrictions.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>[Read-only] Scope of this activity. For more information, see Application Scope.</td>
</tr>
<tr>
<td>Accessible from</td>
<td>Scope restrictions for this workflow. Possible settings are:</td>
</tr>
<tr>
<td></td>
<td>• All application scopes: Workflow is accessible to all application scopes.</td>
</tr>
<tr>
<td></td>
<td>• This application scope only: Workflow access is limited to the scope named in the Application field.</td>
</tr>
<tr>
<td></td>
<td>For more information see Workflow scope on page 3319.</td>
</tr>
</tbody>
</table>
### Schedule

Use the Schedule section to create a schedule for this workflow using the schedule builder.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivery based on</td>
<td>The schedule type for this workflow. Possible types are:</td>
</tr>
<tr>
<td></td>
<td>• User-specified duration: Duration based on a user-specified value. This is the default schedule type.</td>
</tr>
<tr>
<td></td>
<td>• Relative duration: Duration calculated from a preconfigured schedule, such as 8-5 weekdays.</td>
</tr>
<tr>
<td>Expected time</td>
<td>User-defined interval. This field is visible when the schedule type is User-specified duration.</td>
</tr>
<tr>
<td>Schedule</td>
<td>Preconfigured schedule that determines when this workflow runs.</td>
</tr>
<tr>
<td>Timezone</td>
<td>Time zone for this instance.</td>
</tr>
</tbody>
</table>

### Stages

The Stages section appears if you select a table with Type = Workflow.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage</td>
<td>Displays the workflow stage progress on the selected table. Optionally, select Stage rendering and Stage orderschemes to customize the appearance of the stage field. The default values cover typical scenarios.</td>
</tr>
<tr>
<td>Stage rendering</td>
<td>The renderer to use when displaying stage icons on a form or list view. For more information about renderers, see Workflow stage renderers on page 3289.</td>
</tr>
<tr>
<td>Stage order</td>
<td>The order of workflow stages when you view a workflow field in a list. Select Computed to let the workflow engine compute the stage order from the order of execution in the workflow. Select User Specified to use the Order field from that Workflow stages on page 3273.</td>
</tr>
<tr>
<td>Name</td>
<td>The name of the stage as it appears in workflow fields.</td>
</tr>
<tr>
<td>Duration</td>
<td>Time allocated for the specific stage.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Order</td>
<td>The order of workflow stages when you view a workflow field in a list. Select Computed to let the workflow engine compute the stage order from the order of execution in the workflow. Select User Specified to use the Order field from that Workflow stages on page 3273.</td>
</tr>
<tr>
<td>Value</td>
<td>The value of the stage when it is referenced from elsewhere in the system, such as in a script.</td>
</tr>
</tbody>
</table>

**Estimated Runtime**

The Estimated Runtime section opens the controls for configuring the ERT for the workflow. Core workflows included in the base system are not configured for estimated run time by default. All new workflows are configured with default ERT values automatically. You can edit existing run time estimates or configure new ones for any existing workflow. For details about how estimated run times are configured and calculated, see Workflow run time metrics on page 3354.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requires ERT</td>
<td>Check box to indicate that this workflow requires an estimated runtime configuration. You can use the ERT calculations to determine if workflows are running longer or shorter than expected and to identify errors in workflow processing. By default, new workflows require an ERT.</td>
</tr>
<tr>
<td>Estimated Run Time</td>
<td>The initial estimate for the workflow's run time.</td>
</tr>
<tr>
<td>Number of data points</td>
<td>[Read only] The number of times the system has compared the estimated run time to an actual run time result.</td>
</tr>
<tr>
<td>Outlier Percentage Threshold for ERT</td>
<td>[Required] The percentage deviation from the estimated run time that identifies an outlier workflow run time. The system uses a default value of 20. For more information, see Outlying workflow run times on page 3355.</td>
</tr>
</tbody>
</table>

**Create a workflow from a table**

Automate a multi-step process by creating a workflow from the list view of any table that supports workflows.

- If you are designing the workflow as part of an update set process, see Workflow movement with update sets on page 3337 before creating the workflow.

1. Open a table, such as Incident or Problem, in list view. For example, navigate to Incident > Open.
2. Right-click in the column header and select Configure > Workflows.
The Workflow Versions on that table appear in a list.

3. Click New.
   The Workflow Version opens in New Workflow view. The Table field is filled in with the table you selected in step 1 and is read-only.

4. Enter Name.
5. [Optional] Enter Description.
6. [Optional] Edit conditions fields as necessary.
7. Click Submit.
   The new workflow is added to the Workflow Versions list.
8. Click the workflow Name.
   The new workflow is created with the Begin and End activities connected by a single transition.
9. Finish creating the workflow by adding activities, validating, and publishing so the workflow is available to other users.
   For more information, see Work on workflows on page 3236.

10. [Optional] To change advanced settings for the workflow, click the Properties icon. If you make changes, click Update.

Create a workflow for a new service catalog item

When you create a new service catalog item, you can create a new corresponding workflow at the same time.

- If you are designing the workflow as part of an update set process, see Workflow movement with update sets on page 3337 before creating the workflow.

1. Navigate to Service Catalog Catalog Definitions Maintain Items.
2. At the top of the form, next to Catalog Items, click New.

   The Catalog Item form opens.

3. Add a Name.
4. Next to the Workflow field, click the lookup icon.
5. Next to Workflow at the top, click New.
The Workflow version dialog opens in the New Workflow View. The Table field is set to Requested Item (sc_req_item) and is read-only.

6. Add a Name.
7. [Optional] Add a Description.
8. [Optional] Change the stage information as necessary.
9. Click Submit.
The new workflow is created with the Begin and End activities connected by a single transition.

10. Finish creating the workflow by adding activities, validating, and publishing so the workflow is available to other users.  
   For more information, see Work on workflows on page 3236.
11. To change advanced settings for the workflow, click the Properties icon.
12. Click Update.
   If you close the Workflow Editor, you can see the Catalog Item record. Note that the workflow is added to the Workflow field. The Show Workflow and Information icons appear next to the Workflow field. Hover over the information icon to view a read-only summary of the workflow.

Create a workflow for an SLA Definition

Automate a multi-step process by creating a workflow from an SLA definition.

- If you are designing the workflow as part of an update set process, see Workflow movement with update sets on page 3337 before creating the workflow.

1. Open a list of SLA definitions. For example Facilities > SLA Definitions or Service Level Management > SLA Definitions.
2. At the top of the form, next to SLA Definitions, click New.
3. Select Contract SLA or Service Offering SLA.
   The SLA Definition or Service Offering SLA form opens.
4. Next to the Workflow field, click the lookup icon.
5. Next to Workflow at the top, click New.
The Workflow Version dialog shows in the New Workflow view. The Table field is set to SLA Definition (contract_sla) or Service Offering SLA (service_offering_sla) and is read-only.

6. Enter Name.
7. [Optional] Enter Description
8. [Optional] Edit conditions fields as necessary.
9. Click Submit.
   The new workflow is created with the Begin and End activities connected by a single transition.
10. Finish creating the workflow by adding activities, validating, and publishing so the workflow is available to other users.
   For more information, see Work on workflows on page 3236.

11. [Optional] To change advanced settings for the workflow, click the Properties icon. If you make changes, click Update.

Ending workflows with multiple branches

A workflow is complete when it reaches the End activity, even if there are still active branches of the workflow in progress. To ensure that both branches are completed, add a Join activity to resolve the branches.

For example, the following figure shows a workflow with two branches that execute independently. When Task 1 and Task 2 of Branch B are completed, the workflow is marked complete even if the Branch A tasks are not completed.

Figure 726: Workflow with uncompleted branch

For both branches to complete, add a Join activity to resolve the branches. When one branch reaches the join, the workflow waits for the other branch. When both branches are complete, the workflow reaches the end. The Incomplete condition of the a Join activity is met only if one of the branches cannot be completed.
Work on workflows

To complete a workflow, you add workflow activities, validate the workflow, and publish it.

Add a workflow activity

Activities determine the functionality of the workflow.
Role required: workflow_admin, workflow_creator, or admin
When they are created, all workflows contain Start and End activities.
For more information, see Workflow activities on page 3367.
1. Open a workflow.
2. Check out the workflow.
3. Drag a workflow activity from the Activities menu into the workflow body.
4. Populate the Workflow Activity form that appears.

Validate a workflow

You can manually validate a workflow from the Workflow Editor. You can generate a workflow validation report from the Workflow Version form.
Role required: workflow_admin, workflow_creator, or admin
Running a workflow on a new node automatically attempts to validate the workflow. If validation is successful, the system updates the workflow version record to indicate the workflow has been validated and marks the record as updated by the user who ran the workflow.
1. Open the workflow to validate in the Workflow Editor.
   When the workflow is loaded, the workflow validator icon appears in the toolbar.
2. Click the validator icon to run a series of validation tests on the current workflow version and generate a report.

3. Complete the following steps to generate a workflow validation report from the Workflow Version form:
   a) Navigate to Workflow Administration Workflow Versions, and select a workflow to validate.
   b) Under Related Links, click Validate Workflow.

Publish a workflow

When a workflow is complete, publish the workflow so that it is available to all users.

Before you publish a workflow, validate it to test it for issues that might cause it to fail, such as missing subflows or disconnected transitions. For more information, see Workflow validation on page 3294.

Role required: workflow_admin, workflow_creator, or admin
To publish a workflow:

1. Navigate to Workflow Workflow Editor.
2. Open the workflow that you want to publish.
3. In the title bar, click the menu icon and select Publish.

If you published a new version of workflow, the changes are not applied to running workflow contexts. Any currently running workflow context continues using the workflow version that was available when the workflow started. The next time the workflow runs, it uses the new version.

Determine whether a workflow can run

A workflow can run only if a checked out version is available to the user who has it checked out, and a valid, published version is available for all users with permission to run it.

Role required: workflow_admin, workflow_creator, or admin

1. In the navigation filter, enter wf_workflow.list, and then open one of the workflows.
2. In the Versions related list, check for all of the following conditions:
   a) There is only one workflow version in a state of Checked out and Checked out by.
   b) There is only one version and it is not checked out. This version must be both Active and Published.
      You may need to personalize the list and add the Active column.
   c) If there are multiple versions, only one is Published.

These checks determine the only two conditions under which a workflow can run:

- A checked out version of a workflow is available for the user who has it checked out.
- A valid, published version of a workflow is available for all users who have permission to run the workflow.

Main flows containing subflows that do not meet one of these two conditions are not permitted to execute against a current record transaction. Instead, a critical log entry detailing the subflow state is added to the Workflow Context record. To enable the workflow to execute on the next appropriate transaction, remove the subflow from the main flow or modify the published and active states of the subflow.

Edit a published workflow

You can edit a published workflow after you check it out.

Role required: workflow_admin, workflow_creator, workflow_publisher, or admin

**Note:** You cannot check out or delete workflows that are associated with a read-only application file.

To check out a workflow:

1. Navigate to Workflow Workflow Editor.
2. Open the workflow that you want to edit.
3. In the title bar, click the menu icon and select Checkout.

A new version of the workflow is created and assigned to you.

If you are in a different domain than the published workflow, the new workflow version is created in your domain.
After you finish editing the workflow, validate and publish the workflow to make the new version available to other users.

Copy a workflow between two application scopes

Application scoping protects applications by identifying and restricting access to application files and data. You can copy a workflow created in one application scope (for example, Test) to another (Production) as needed.

Role required: admin

1. On the Home page, click located next to the logged in user name.
2. In the Developer tab, in the Application field, select the application scope (for example, Test) in which you want to operate the ServiceNow platform.
3. Close the System Settings page.
4. Navigate to Workflow Workflow Editor.
5. Create a workflow in the Workflow Editor. For more details, see Create a workflow on page 3222.
6. In the Workflow Editor, click.
7. In the Application tab, Application is set to the current application scope selected in System Settings.
8. In Accessible from, select All application scopes if the workflow is available to all application scopes, or select This application scope only if it is only available to, and accessible in the current application scope only.
   Only those workflows that are accessible from all application scopes can be copied to another application scope.
9. Go back to the Homepage, click.
10. In the Developer tab, in the Application field, select the application scope (for example, Production) to which you want to copy the workflow.
11. Navigate to Workflow Workflow Editor.
12. Refresh the page, then open the same workflow you created.
   An Out of scope workflow, workflow belongs to <scope name> scope message appears, where <scope name> is the application scope in which the workflow was originally created.
13. In the Workflow Editor, click.
14. Select Copy.
   The Workflow Name dialog appears:
a) In Workflow Name, type the new name for the copied workflow.
b) Click OK. The system creates a workflow in the current application scope.

15. In the Workflow Editor, click

16. In the Application tab, Application is set to the current application scope.
17. In Accessible from, select This application scope only if to make the newly copied workflow a private one that cannot be accessed from outside current scope.
18. Click Update.

A new workflow record is created in the selected application scope and marked as private if designated as one in the Workflow Editor.

Workflows used as subflows

A workflow can launch another workflow as an activity.

The parent workflow triggers the subflow and then waits for the subflow to complete before continuing. Run the workflow validation tool prior to publishing to detect missing subflows and other dependency problems, such as those involving update sets.

The Workflows tab in the Workflow Editor contains a list of the workflows available for use as subflows.

Figure 728: Workflows available to use as subflows
Make sure that the selected subflow is active. If the subflow is inactive, the main workflow will hang with a Loading message. If you place an inactive subflow into a workflow, the subflow appears with a red banner, indicating that it cannot run. An active subflow is highlighted in blue when selected.

Figure 729: Workflow with active subflows

**Subflows and the Create Task activity**

If a workflow contains a *Create Task* activity that has executed on the current record, additional task activities in the workflow might not execute as expected.

This can happen when the same subflow containing a Create Task activity runs more than once in a parent flow. When the subflow reruns and attempts to execute the Create Task activity again, the system reopens the first task activity instead and does not create an additional task.

**Note:** An alternative to creating duplicate subflows that use the Create Task activity is to add a *Run Script* activity to the workflow that creates a task with a script.
Figure 730: The same create task activity runs twice in a workflow

In this configuration, the workflow does not run the same subflow containing a Create Task activity more than once. This allows the workflow to create additional tasks.
Pass a variable from a workflow to a subflow

Use this process to pass variables from a parent workflow to a subflow.

Role required: workflow_admin, workflow_creator, or admin

**Note:** You can also use the Return Value activity in the subflow to return values to the parent workflow. Make sure to have a Return Value on every ending transition path.

1. Prepare the subflow to accept variables from the parent workflow by defining the inputs.
2. Include the subflow in the parent workflow and connect the inputs to the parent workflow variables.

**Note:** Subflows on the Requested Item [sc_req_item] table in the Service Catalog cannot accept variables from parent workflows.

**Define inputs for a subflow**

Define the input variables for a workflow to request from parent workflows when it is launched as a subflow.

All inputs are stored in the Variables [var_dictionary] table.

1. In the editor, open and check out the workflow.
2. In the title bar, click the menu icon and select Edit Inputs.
3. In the Workflow Inputs window, click New.
4. Populate the record with the definition of the variable, including the column name, the label that is displayed to the user, and the type of field.
5. Click Submit.

*Invoke a subflow in a workflow*

Use this procedure to add a subflow to a workflow.

1. In the Workflow Editor, open and check out the parent workflow.
2. Drag the subflow from the Workflows tab to the parent workflow.
3. In the New Activity dialog box, define the variables defined by the subflow’s Inputs.

   These fields can accept both static values or variables in the following format:

   ${variable_name}

4. Click Submit.

   The workflow triggers the subflow at the appropriate time and passes the variables as indicated by the Inputs definition.

*Prepare a subflow*

Review the process of preparing a subflow for use in a parent workflow, and for preparing the parent workflow to use a subflow.

1. In the editor, open and check out the workflow that you want to use as a subflow.
2. In the title bar, click the menu icon and select Edit Inputs.

3. In the Workflow Inputs window, click New in the Variables list.
4. Add a new variable depending on the type of values that it is going to store. The following example sets up a string value.

5. Click Submit.

6. Close the Workflows Inputs dialog.

7. Create a Run Script activity on the subflow.
   - Set the value from the parameter to a field on the current form. This is important because the Notification activity can only pull values from the current variable and not from the newly added variable. The following example sets the value in the Description field.

```
current.description = workflow.inputs.bluesubvariable;
```

- Create a new field on the request form but do not display the field. This serves as temporary storage.
8. Create a Notification activity on the subflow. Use ${description} in the subject to return the value from the field.
This is what the subflow would look like:
Prepare a workflow to use a subflow
After you create a subflow, use this procedure to prepare the parent workflow.

1. On the parent workflow, create a variable similar to what you did on the subflow, but name it something different.
   
   In the following example, the variable is named Blue Main Variable.

   ![Variable creation screenshot]

2. Click Submit.

3. Insert a Run Script activity to return the value from a field to the newly created variable.
   
   In this example, the value of the Short Description field is returned and given to the newly created variable.

   ```javascript
   workflow.scratchpad.bluemainvariable = current.short_description;
   ```
4. Click Submit.
5. In the subflow activity, set the Blue Sub Variable to pass the bluemainvariable to the bluesubvariable. 
   \$\{\text{workflow.scratchpad.bluemainvariable}\}

   This is what the main workflow looks like:
Using variables in a workflow

Within workflow there are several different types of variables that are available.

Some variables define, describe, or compose the pieces of the workflow (such as workflow activities). Some variables are available specifically to facilitate the execution of a workflow (such as scratchpad variables). Some variables define, describe, or compose the data records being manipulated by the workflow process (for example, the elements of a Glide Record that are defined in a dictionary.xml file describing a record, such as an incident).

Activity variables

Activity variables are properties specifically associated with a workflow activity.

These are the inputs that appear on the activity definition when a specific activity is dragged onto the workflow canvas. These variables are properties that define, compose or describe the workflow activity, or the work it is designed to perform.

Activity variables are declared in a related list within the Workflow Activity Definition.

To add, view, or modify a variable:

1. Navigate to Workflow Activity Definitions.
2. Select a workflow activity, such as Approval - User.
3. In the Activity Variables section or tab, add, view, or modify the variables. Activity variables are defined using the same fields as Dictionary records.

**Note:** If defining a new activity variable that is dependent on another activity variable, put the prefix "vars." before the name of the parent activity variable. For example, if the child field is dependent on a field named parent, put the value vars.parent in the Dependent field.

To control the visibility of an activity variable on the workflow canvas after the activity has been dragged to the canvas, use a UI policy on the wf_activity table.

To access the variables or assign values to these variables within the workflow activity, use the vars variable of the workflow activity.

```
activity.vars.variable_name = new_variable_value
```

Workflow input variables

Workflow variables are external values that are passed into and referenced by a workflow during its execution.

Workflow variables can be declared externally in a script and passed into a main workflow or they can be declared within a main workflow and passed as inputs to a subflow.

**Note:** There is a specific kind of input variable for any workflow that is declared against the table Requested Item [sc_request_item]. To understand the use of these variables see Workflow catalog variables on page 3254.

Workflow variables are declared in a form available from the Workflow Editor gear menu.

To add, view, or modify a variable:

1. Navigate to Workflow Workflow Editor.
2. Edit and checkout a workflow.
3. Select the Workflow Activities menu and select Edit Inputs.
4. Select an existing variable or click New.

Note the Column name field. Use this value when accessing the variable from a script.

Workflow variables do not appear on the workflow canvas, they are only available for view from the Workflow Activity menu.

The input variables are available to use in scripts. To access an input variable from a script:

```javascript
var input = workflow.variables.variableName // get the workflow variable identified by column name.
```

Assigning values to variables from outside of workflow

After being declared in a workflow, values can be assigned to the variables from where the workflow is kicked off.

The following example demonstrates how a workflow variable's value can be set in a script include, business rule, or UI action:

```javascript
//Declare an instance of workflow.js
var wf = new Workflow() //Get the workflow id
var wfId = wf.getWorkflowFromName( "Workflow Name" ) ;
//Start workflow, passing along name : value pair(s) for mapping to variable
//where input_var_name is the name of the variable declared in gear menu
//and input_var_value is whatever that value should be for this execution of workflow
wf.startFlow(wfId , null , "Workflow Name" , {input_var_name : input_var_value } ) ;
```

Another example that demonstrates a more readable way of passing multiple variables involves declaring an object, adding the names/values to the object, and passing it:

```javascript
//Declare an instance of workflow.js
var wf = new Workflow() //Get the workflow id
var wfId = wf.getWorkflowFromName( "Workflow Name" ) ;
//Start workflow, passing along object containing name/value pairs mapping to inputs expected by the workflow
var vars = { } ;
vars.input_var_name1 = input_var_value1 ;
vars.input_var_name2 = input_var_value2 ;
//add as many variables as your workflow is expecting, then pass the object
wf.startFlow(wfId , null , "Workflow Name" , vars ) ;
```

Assigning Values for Subflow Inputs from inside of a Main Workflow

If a workflow that accepts inputs is called from within another workflow, those input values can be set from the workflow canvas within the UI of the workflow activity. Each input variable declared for a subflow will have a text box input area displayed on the activity. Within these text boxes, the variables can be set with any value either from the scratchpad or from within the current record.

For more information, see Workflows used as subflows on page 3240.

Reading the Value of a Workflow Input Variable

The value of a Workflow input variable is accessible anywhere within the workflow that accepts javascript by dot walking the current workflow object:

```javascript
var readValue = workflow.inputs.variable_name;
```
Workflow scratchpad variables

Store and share string-based variables as name-value pairs between workflow activities. The scratchpad is global to the instance of the running workflow and as such, is available equally to all activities.

Declaration

The scratchpad itself is automatically available to an executing workflow and requires no specific declaration. Variables are declared and stored in the scratchpad simultaneously by referencing it. For example:

```
workflow.scratchpad.variableName = variableValue;
```

Display

View activity scratchpad values from the Workflow Activity History Scratchpad [wf_history_scratchpad] table. Workflow Activity History Scratchpad is also an embedded list in Workflow Activity History records.
Figure 732: Sample Workflow Activity History Scratchpad records
Access and Assignment

Use standard JavaScript object notation to access or assign scratchpad values. For example, use this format to assign a particular scratchpad variable value.

`workflow.scratchpad.variableName = variableValue;`

Use this format to assign a JavaScript variable to a scratchpad variable.

`var myValue = workflow.scratchpad.variableName;`

Current variables

Current is the database GlideRecord that kicked off the workflow, either by association to the table in the Workflow properties table or by being associated with a catalog item.

Declaration

Variables in current are the columns that are defined in the dictionary.xml file that support the database record. There is no way at runtime to add variables to the current record.

Display

Variables of a current record are displayed on the Glide Forms and Lists throughout the applications that use them.

Access and Assignment

To access the variables or assign values to the variables within the workflow activity, get the value from the current record by referencing the Glide Element.

`var myVarValue = current.getElement(nameOfTheField);`

or

`var myVarValue = current.fieldName;`

or

`current.variableName.setValue( "A Variable Value");`

Workflow catalog variables

Workflows that are associated with the Requested Item [sc_req_item] table have a specific type of workflow input.

The inputs into this workflow are essentially question:answer pairings that, when associated with a specific catalog task, become options on the task form. These options are generated by that catalog task activity within a workflow.

Scope

For the purposes of Service Catalog and workflow, a variable’s scope determines its availability to a catalog task activity within a workflow. You can define variables as global or catalog item-specific. When a variable is associated to a catalog item and the workflow generating the catalog task is associated to the catalog item, the variable scope determines which variables are available for mapping within the catalog
task activity in a workflow. If a workflow is associated with Requested Item [sc_request_item], and is not specifically associated with a catalog item, any catalog variable with a blank Cat Item field value is available to all catalog task activities within the workflow.

Declaration

You can declare requested item catalog variables at the catalog item level or at a global level.

You can declare global catalog variables using the Workflow Editor context menu.

Also see, _Global variable declaration option 2_.

1. Navigate to Workflow Workflow Editor .
2. Open and check out a workflow that runs against the Requested Item [sc_req_item] table.
3. Click the menu icon and select Edit Catalog Variables.
4. Click New to create a new variable or select an existing variable.
5. Select the Global check box.
6. Click Submit.

_Global variable declaration option 2_

You can declare global catalog variables using the Service Catalog.

1. Navigate to Service Catalog Item Variables .
2. The list of variables that appears in the workspace has a default filter of Cat Item != <blank>. Change the filter to Cat Item = <blank> and run the query.
   The catalog variables that appear are available to any catalog task that is initiated from within a workflow.
3. Click New to create a new variable.
4. Leave the Cat Item field blank.
5. Select the Global check box.
6. Click Submit.
   Also see, _Global variable declaration option 1_.

_Catalog item specific variable declaration option 1_

You can declare a catalog item-specific variable.

These variables are only available to the catalog item referenced in the Cat Item field on the variable record.

1. Navigate to Service Catalog Catalog Variables Item Variables .
   Note the list of variables that appears in the workspace has a default filter of Cat Item != <blank>.
2. Enter or select a catalog item in the Cat Item reference field.
   Selecting a Cat Item restricts the scope and availability of the catalog variable to that specific catalog item.
3. Click Submit.
   Also see, _Catalog item specific variable declaration option 2_.

_Catalog item specific variable declaration option 2_

You can declare a catalog item-specific variable directly from a catalog item record.

Creating a catalog variable in this way automatically sets the Cat Item reference to the catalog item selected.

1. Navigate to Service Catalog Catalog Definitions Maintain Items .
2. Select or create an a catalog item.
Note the Variables related list. All variables declared using this related list have a Cat Item reference value of the current catalog item.

3. From the Variables related list, click New.
4. Ensure that the Cat Item field correctly references the catalog item previously selected or created.
5. Go to or open the Question section or tab.
6. Add a Question.
7. Add a Name.
   Variable names should not include white space and cannot begin with a number.
8. Click Submit.
   Also see, Catalog item specific variable declaration option 1.

Display

Catalog specific item variables are visible in several places depending on where in the process the variable is viewed.

Declaration can happen and variables can be seen from within the menu, inside both the Maintain Items module and in the Item Variable modules of the Service Catalog.

Within a workflow, the Catalog Specific Item variables are available to the Catalog Task activity in the form of a slushbucket at the bottom of the Catalog Task activity. Item variables that are selected, are the question and answer pairs that will appear on the task that is generated by that instance of Catalog Task when executing that workflow.

If a workflow is associated with a specific catalog item, the association acts as a filter for item variables that appear in the slushbucket of the Catalog Task activity.

The last place the variables are seen is in the task form that is generated by the Catalog Task Item. The variables selected in the slushbucket are the question and answer pairs that appear to the user on the task form.

Access and assignment

The Catalog Item Variables are available and assigned to a specific Catalog Task activity (thereby to a specific task) using the slushbucket entry of a catalog task.

The user working the task enters the values of the variables.

To access the values of a Catalog Item Variable inside a script:

```javascript
var gr = current; // or create and query a new GlideRecord
var itemVariable = gr.variables[variableName]; //access the service catalog variable identified by the variable name.
var itemVariableValue = itemVariable.getValue();
var itemVariableName = itemVariable.getName();
var itemQuestion = itemVariable.getQuestion(); //All GlideappQuestion API are accessible on itemQuestion
```

Workflow events

The system employs two types of events: registered platform events and workflow events.

Registered platform events

Registered events are created in business rules and are used for such tasks as sending email notifications when records are inserted into the database. Workflow events are registered within workflows only and
are not used anywhere else in the platform. Registered platform events can be triggered by a workflow for external use, but cannot be used within a workflow.

Workflow events

Workflow events follow different rules than platform events that are registered using the event registry. Platform events are entered into the Event Registration [sys/event_register] table and are available for platform processes to use. Workflow events are triggered exclusively for the workflow engine and are used only to direct the work of executing workflow contexts. When an event is registered in a workflow, it is attached to a currently executing activity in the registered_events column of the Workflow Executing Activity [wf_executing] table.

Workflow events also can be broadcast to a workflow from any scripting source that has access to the workflow context, such as a script include or a Run Script activity. In this case, the event, such as cancel, is passed to all records in the Workflow Executing [wf_executing] table for a specific context.

Whether by registry or by broadcast, an event is handled by the activity definition associated with the currently executing activity. Each activity definition comes with a set of handlers. For example, most activities come with onExecute, onCancel, and onUpdate event handlers. As an example of a more specific event, the Approval - User activity also comes with onDetermineApprovalState, which is specific to the work of the approval activity.

Multiple parallel events

A single workflow can have multiple event threads running concurrently, such as when a workflow has timers that overlap on separate workflow branches. If any additional thread completes before the first thread, the system stores event information from the additional thread on the Workflow Queued Commands [wf_command] table. After the first thread completes, the system retrieves the information stored by the additional thread and proceeds through the workflow with the event information from each thread.

Workflow events in the base system

Several workflow events are available in the base system.

Table 1250: Workflow events in the base system

<table>
<thead>
<tr>
<th>Event</th>
<th>Description</th>
<th>Purpose</th>
<th>To use</th>
<th>Source</th>
<th>Thread</th>
<th>Listeners</th>
</tr>
</thead>
<tbody>
<tr>
<td>activityComplete</td>
<td>String value used by activity definitions to respond to the onActivityComplete event handler.</td>
<td>Informs records in the Workflow Executing Activity [wf_executing] table about the completion of other activities in the same workflow context.</td>
<td>If the activity is allowed to set the boolean value for wf_executing/notify_termination then set the value to true (activity.notify_termination = true) during the onExecute event.</td>
<td>Workflow Engine, Process Terminations</td>
<td>Current thread, current mutex termination</td>
<td>Join activity</td>
</tr>
<tr>
<td>Event</td>
<td>Description</td>
<td>Purpose</td>
<td>To use</td>
<td>Source</td>
<td>Thread</td>
<td>Listeners</td>
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<tr>
<td>otherEvent</td>
<td>String value used by the Join activity to respond to an otherEvent.</td>
<td>Informs records in the Workflow Executing Activity [wf_executing] table about an otherEvent that has completed.</td>
<td>The Join activity transitions from n number of preceding activities. These preceding activities all create a wf_executing record, which causes a check to see if the record already exists. If the Join already exists, then the Join created by the executing transition sets the wf_executing record for deletion.</td>
<td>Join activity</td>
<td>Current thread, current mutex</td>
<td>Join activity, onOtherEvent event handler</td>
</tr>
<tr>
<td>timer</td>
<td>String value used by workflow activities to respond to a Timer activity that has expired.</td>
<td>Allows wf_executing records to be informed about a timer activity that has completed and has fired the timer event.</td>
<td>The Timer activity schedules a job that calls a script. The script calls fireEvent (wf_executing, timer).</td>
<td>Timer activity</td>
<td>Worker thread, private mutex</td>
<td>Timer activity, onTimer event handler</td>
</tr>
<tr>
<td>Event</td>
<td>Description</td>
<td>Purpose</td>
<td>To use</td>
<td>Source</td>
<td>Thread</td>
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<tr>
<td>execute</td>
<td>String value used by workflow activities to respond to a Timer activity that has expired.</td>
<td>Informs a record in the wf_executing table with the initial state of Executing to proceed with its primary work.</td>
<td>The workflow engine, for each transition executed, creates an executing record with a state of Executing. Once created, the executing record is put in a queue for processing. For each item in the queue, the Rhino globals are established, the activity definition that drives the executing record is instantiated, and the run() function is called. When the state of a record is Executing, this function always calls onExecute.</td>
<td>Workflow engine, via the WFAActivity Handler</td>
<td>Current thread, current mutex</td>
<td>All activities, onExecute event handler</td>
</tr>
<tr>
<td>Event</td>
<td>Description</td>
<td>Purpose</td>
<td>To use</td>
<td>Source</td>
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<tr>
<td>execute (specific to Lock)</td>
<td>String value used by the Lock activity to respond to a waiting lock that is ready to make another attempt to obtain a specific lock. This execute is different than the previous execute because it is called on a separate thread, at specified intervals, and is treated as an outside event.</td>
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<td></td>
<td></td>
<td>Informs a Lock activity waiting to execute that the specified wait interval has passed and that it should attempt to get the lock again.</td>
<td>Lock activity schedules a job with a script that uses the workflow script include's fireEvent(wf_executing, 'execute') method.</td>
<td>Lock activity via a scheduled job</td>
<td>Worker thread, private mutex</td>
<td>Lock activity, onExecute event handler</td>
</tr>
<tr>
<td>determineApprovalState</td>
<td>String value used by approval activities to respond to a change in the overall approval status of the current record.</td>
<td>Informs Approval Coordinator about an approval that completed and triggered the timer event.</td>
<td>Approval Coordinator triggers the event during its onExecute</td>
<td>Approval Coordinator, Approval - User, and Approval - Group all have onDetermineApprovalState event handlers. If the state is anything but Requested, the activity is considered finished, and the approval state (Approved, Rejected, Cancelled) is set to the wf_executing.result column.</td>
<td>Current thread, current mutex</td>
<td>ApprovalState event handlers, Approval Coordinator, Approval - User, and Approval - Group all have onDetermineApprovalState event handlers. If the state is anything but Requested, the activity is considered finished, and the approval state (Approved, Rejected, Cancelled) is set to the wf_executing.result column.</td>
</tr>
<tr>
<td>Event</td>
<td>Description</td>
<td>Purpose</td>
<td>To use</td>
<td>Source</td>
<td>Thread</td>
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<tr>
<td>cancel (from within activity definitions)</td>
<td>String value used by workflow activities to respond to a request for cancellation.</td>
<td>Informs all wf_executing records in a context that the workflow is being canceled.</td>
<td>The End activity uses the global workflow.broadcastEvent('cancel') to interrupt the currently running wf_executing records. This changes the state of those records to Cancelled.</td>
<td>End activity broadcastEvent('cancel')</td>
<td>Current thread, current mutex</td>
<td>All activities, onCancel event handler</td>
</tr>
<tr>
<td>Event</td>
<td>Description</td>
<td>Purpose</td>
<td>To use</td>
<td>Source</td>
<td>Thread</td>
<td>Listeners</td>
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</tr>
<tr>
<td>cancel (outside current context)</td>
<td>String value used by workflow activities to respond to a request for cancellation.</td>
<td>This event is the same as the cancel event above and handled the same. However, the management of this event is subtly different. This event informs all wf_executing records in a context that the workflow is being canceled. The event is managed via the onCancel event handler of each executing activity definition, but the event is called differently. In particular, the call to cancel from outside an activity definition is blocked by the current mutex. This is a significant difference in that the event does not interrupt a currently executing activity that is still operating within the parameters of the current mutex.</td>
<td>Any script can call cancel on a known executing context via the workflow script include. For example, var w = new Workflow(); w.cancel(context); //where context is a GlideRecord of the context to be canceled.</td>
<td>Any script include, scheduled job, UI action, or other source</td>
<td>Current thread, private mutex</td>
<td>All activities, onCancel event handler</td>
</tr>
<tr>
<td>Event</td>
<td>Description</td>
<td>Purpose</td>
<td>To use</td>
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</tr>
<tr>
<td>stop (see End activity)</td>
<td>The End activity checks for this event.</td>
<td>If the stop event is the current event, then the cancel operation of the End activity is bypassed.</td>
<td>Only in the End activity.</td>
<td>Any script can trigger or broadcast the stop event via a script include or workflow Run Script activity</td>
<td>Current thread, current mutex</td>
<td>This event is used by the End activity to exclude the Cancel activity and allow a workflow to end, even if canceled.</td>
</tr>
<tr>
<td>listener</td>
<td>String value that the workflow (subflow) activity triggers as an event.</td>
<td>When a main workflow calls a subflow, the workflow keeps the ID of the subflow's context in the scratchpad. When the subflow is complete, it triggers the listener event via a business rule.</td>
<td>The listener event is passed to the parent context on completion of a subflow and is managed by the onListener action of the workflow activity.</td>
<td>Business rule that is triggered by the update of a workflow that has a parent</td>
<td>Current thread, current mutex</td>
<td>This event is used by a subflow to inform it's parent flow that it is complete. The parent workflow will react to this event and continue.</td>
</tr>
<tr>
<td>probe_complete</td>
<td>String value triggered in the workflow by an Orchestration activity indicating that the MID Server has completed a task.</td>
<td>The probe_complete event is triggered from Orchestration sensor processors via the workflow helper function handleEventById.</td>
<td>The probe_complete event handler is in the WebService and is used by most Orchestration activities.</td>
<td>Event used to restate a workflow that is waiting for the MID Server to process a task or activity</td>
<td>Worker thread, private mutex</td>
<td>Orchestration activities</td>
</tr>
</tbody>
</table>
### Glide events relative to workflows

Workflow uses several Glide events.

<table>
<thead>
<tr>
<th>Event</th>
<th>Description</th>
<th>Purpose</th>
<th>To use</th>
<th>Source</th>
<th>Thread</th>
<th>Listeners</th>
</tr>
</thead>
<tbody>
<tr>
<td>pause</td>
<td>String value sent to a workflow from an SLA to pause the Timer activity.</td>
<td>When an SLA is paused, the SLA workflows must be paused if there is a timer running.</td>
<td>Use is exclusive to the SLA timer</td>
<td>SLA</td>
<td>Business rule thread, private mutex</td>
<td>Timer activity</td>
</tr>
<tr>
<td>resume</td>
<td>String value used by the Timer activity to resume a paused timer (see pause).</td>
<td>When an SLA is resumed, the SLA workflows must be resumed as well.</td>
<td>Use is exclusive to the SLA timer</td>
<td>SLA</td>
<td>Business rule thread, private mutex</td>
<td>Timer activity</td>
</tr>
</tbody>
</table>

Table 1251: Workflow Glide events

<table>
<thead>
<tr>
<th>Event</th>
<th>Description</th>
<th>Purpose</th>
<th>To Use</th>
<th>Source</th>
<th>Thread</th>
<th>Listeners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insert</td>
<td>Global event set upon the insert of a GlideRecord that causes the script engine, and through that the workflow engine, to wake up.</td>
<td>Starts workflows that are associated with the current GlideRecord either by reference, as in request items and SLA timers, or by conditions associated with the GlideRecord's table.</td>
<td>There is no explicit customer-facing use for this in a workflow. It is part of the Glide engine, and with this event, the only thing workflows can do is start. Workflows can also be started manually using a script.</td>
<td>Workflow Engine, RunEngine</td>
<td>Current thread, current mutex</td>
<td>User action of insert</td>
</tr>
<tr>
<td>Event</td>
<td>Description</td>
<td>Purpose</td>
<td>To Use</td>
<td>Source</td>
<td>Thread</td>
<td>Listeners</td>
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</tr>
<tr>
<td>Update</td>
<td>Global event set upon the update of a GlideRecord that causes the script engine, and through that the workflow engine, to wake up.</td>
<td>Looks to the Workflow Context [wf_context] table to find running workflows that are associated with the current GlideRecord by document ID.</td>
<td>There is no explicit customer-facing use for this in a workflow. It is part of the Glide engine, and with this event, the only thing workflows can do is advance through the next set of transitions.</td>
<td>Workflow Engine, RunEngine</td>
<td>Current thread, current mutex</td>
<td>User action of update of a GlideRecord</td>
</tr>
<tr>
<td>Delete</td>
<td>Global event set upon the delete of a GlideRecord that causes the script engine, and through that the workflow engine, to wake up.</td>
<td>Looks to the Workflow Context [wf_context] table to find running workflows that are associated with the current GlideRecord by document ID.</td>
<td>There is no explicit customer-facing use for this in a workflow. It is part of the Glide engine, and with this event, the only thing workflows can do is advance through the next set of transitions.</td>
<td>Workflow Engine, RunEngine</td>
<td>Current thread, current mutex</td>
<td>User action of delete of a GlideRecord</td>
</tr>
<tr>
<td>Event</td>
<td>Description</td>
<td>Purpose</td>
<td>To Use</td>
<td>Source</td>
<td>Thread</td>
<td>Listeners</td>
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</tr>
<tr>
<td>Query</td>
<td>Global event set upon the query of the Glide database that causes the script engine, and through that the workflow engine, to wake up.</td>
<td>Looks to the Workflow Context [wf_context] table to find running workflows that are associated with the current GlideRecord by document ID.</td>
<td>There is no explicit customer-facing use for this in a workflow. It is part of the Glide engine, and with this event, the only thing workflows can do is advance through the next set of transitions.</td>
<td>Workflow Engine, RunEngine</td>
<td>Current thread, current mutex</td>
<td>User action of query of a GlideRecord</td>
</tr>
</tbody>
</table>

*Workflow event-specific functions*

There are several functions that relate specifically to workflow events.
<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
<th>Purpose</th>
<th>Use</th>
<th>Thread</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>registerForEvent</td>
<td>Function in the workflow environment that writes events represented as strings to the wf_executing_registered_events field.</td>
<td>The workflow events are just strings. When an activity that has registered for an event executes, a comma delimited set of events is stored with the Workflow Executing Activity [wf_executing] record. When the event is triggered in the workflow context, the wf_executing table looks for all executing records that contain the string that represents the event in the wf_executing_registered_events field.</td>
<td>The global variable workflow that is available to all Workflow Activity [wf_activity] records is the source of the call. For example, from inside a Run Script activity, a designer can write: workflow.registerForEvent('myEventName');</td>
<td>Current thread, current mutex</td>
<td>Global variable workflow</td>
</tr>
<tr>
<td>Function</td>
<td>Description</td>
<td>Purpose</td>
<td>Use</td>
<td>Thread</td>
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</tr>
<tr>
<td><code>unRegisterForEvent(eventName)</code></td>
<td>Function in the workflow environment that removes a string value representing an event that has been written to the <code>wf_executing.registered_events</code> field.</td>
<td>The workflow events are just strings that are written to the <code>wf_executing.registered_events</code> field. When an activity unRegisters for an event, the comma delimited set of events stored with the Workflow Executing Activity <code>[wf_executing]</code> record is searched, and if that string is found, it is removed.</td>
<td>The global variable workflow that is available to all Workflow Activity <code>[wf_activity]</code> records is the source of the call. For example, from inside a Run Script activity, a designer can write: <code>workflow.unRegisterForEvent('myEventName');</code></td>
<td>Current thread, current mutex</td>
<td>Global variable workflow</td>
</tr>
<tr>
<td><code>fireEvent(eventName)</code></td>
<td>Function in the workflow environment that examines the contents of the <code>wf_executing.registered_events</code> field, comparing its contents to the <code>eventName</code> passed in.</td>
<td>The workflow events are just strings that are written to the <code>wf_executing.registered_events</code> field. When <code>fireEvent(eventName)</code> is called by a workflow activity, the workflow engine queues up any executing records that contain the string in the registered field.</td>
<td>The global variable workflow that is available to all Workflow Activity <code>[wf_activity]</code> records is the source of the call. For example, from inside a Run Script activity, a designer can write: <code>workflow.fireEvent('myEventName');</code></td>
<td>Current thread, current mutex</td>
<td>Global variable workflow</td>
</tr>
<tr>
<td>Function</td>
<td>Description</td>
<td>Purpose</td>
<td>Use</td>
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<tr>
<td>fireEvent(eventRecord, eventName)</td>
<td>Function in the workflow environment that sends an event to a specific Workflow Executing Activity [wf_executing] record. The eventRecord is a GlideRecord of the type wf_executing.</td>
<td>This event call expects an onMyEvent event handler in the activity represented in the event record (Workflow Executing Activity [wf_executing] table). When fireEvent(eventRecord, eventName) is called by a workflow activity, the workflow engine queues up the specific executing record with that event and passes the event into the activity definition for the on&lt;eventName&gt; handler to manage. This event is queued up in its own mutex, so the current queue completes before this event is processed.</td>
<td>The workflow script include contains the call for this. For example, from inside a Run Script activity, a designer can write: var w = new Workflow(); w.fireEvent(executing, eventName);</td>
<td>Current thread, current mutex</td>
<td>Workflow script include</td>
</tr>
<tr>
<td>Function</td>
<td>Description</td>
<td>Purpose</td>
<td>Use</td>
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<tr>
<td>fireEvent(\text{eventRecordSysId, eventName})</td>
<td>Function in the workflow environment that sends an event to a specific Workflow Executing Activity [wf_executing] record. The eventRecordSysId is the sys_id of a GlideRecord of the type wf_executing.</td>
<td>This is the same as the fireEvent above, except that it accepts an ID and returns the Workflow Executing Activity [wf_executing] record.</td>
<td>The Workflow script include contains the call for this. For example, from inside a Run Script activity, a designer can write: var w = new Workflow(); w.fireEvent(executing, eventName);</td>
<td>Current thread, current mutex</td>
<td>Workflow script include</td>
</tr>
<tr>
<td>fireEvent(\text{eventRecordSysId, eventName, optionalJSONObject})</td>
<td>Function in the workflow environment that sends an event to a specific Workflow Executing Activity [wf_executing] record. The eventRecordSysId is the sys_id of a GlideRecord of the type wf_executing.</td>
<td>This is the same as the fireEvent above, except that it accepts a JSON object as a third parameter. This object can specify any data expressible as JSON. You can also specify additional functionality when creating a workflow activity.</td>
<td>The Workflow script include contains the call for this. For example, from inside a Run Script activity, a designer can write: var w = new Workflow(); w.fireEvent(executing, eventName, JSONObject);</td>
<td>Current thread, current mutex</td>
<td>Workflow script include</td>
</tr>
<tr>
<td>broadcastEvent(\text{contextId, eventName})</td>
<td>Function in the workflow environment that sends an event to all currently running Workflow Executing Activity [wf_executing] records in a specified context, regardless of their state.</td>
<td>This is the same as the fireEvent above, except that it accepts an ID and returns the Workflow Executing Activity [wf_executing] record.</td>
<td>The Workflow script include contains the call for this. For example, from inside a Run Script activity, a designer can write: var w = new Workflow(); w.broadcastEvent(contextId, eventName);</td>
<td>Current thread, current mutex</td>
<td>Workflow script include</td>
</tr>
<tr>
<td>Function</td>
<td>Description</td>
<td>Purpose</td>
<td>Use</td>
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</tr>
<tr>
<td>broadcastEvent</td>
<td>Function in the workflow environment that sends an event to all currently</td>
<td>This should not be confused with broadcastEvent above. This event is</td>
<td>This is available only through the global workflow variable of the</td>
<td>Current thread, current mutex</td>
<td>Global variable workflow</td>
</tr>
<tr>
<td>(eventName)</td>
<td>running Workflow Executing Activity [wf_executing] records in the current</td>
<td>only available to current Workflow Executing Activity [wf_executing]</td>
<td>the current context. The following is an example of its use from</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>context, regardless of their state.</td>
<td>records.</td>
<td>within an activity definition's script: workflow.broadcastEvent</td>
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<tr>
<td></td>
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<td></td>
<td>(eventName)</td>
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</tbody>
</table>

*Event-specific workflow activities*

The following workflow activities trigger events.
### Table 1253: Event-specific workflow activities

<table>
<thead>
<tr>
<th>Activity Name</th>
<th>Description</th>
<th>Purpose</th>
<th>To Use</th>
<th>Source</th>
<th>Thread</th>
<th>Listeners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create Event</td>
<td>Requires an event from the event registry rather than a workflow event. This activity is located in the Notification category of the workflow tree.</td>
<td>Fires the notification event specified in the Workflow Activity [wf_activity] table.</td>
<td>1. Navigate to System Policy Events Registry 2. Create an event. 3. Navigate to System Policy Templates and create an email template. 4. Navigate to System Policy Email Notifications. 5. Create a new notification that is triggered by the event you created and sends the template you created. 6. On the workflow canvas, drag the Create Event activity onto the canvas and</td>
<td>Event Registry</td>
<td>Triggered in the current thread and handled on the worker thread in notifications. Never processed by a workflow</td>
<td>On the notification thread, outside of workflow</td>
</tr>
<tr>
<td>Activity Name</td>
<td>Description</td>
<td>Purpose</td>
<td>To Use</td>
<td>Source</td>
<td>Thread</td>
<td>Listeners</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>-------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Wait for WF Event</td>
<td>Listens for workflow events, as described in the Workflow Events in the Base System table, and only within the current context. This activity is located in the Conditions category of the workflow tree.</td>
<td>Waits for another transition branch of the current context to trigger an event.</td>
<td>Takes an event name as input. When the activity is executed, the specified event name is added to a string array stored in the registered_events column. The values in this column are in a list of all events the activity waits for when it is executing.</td>
<td>The Wait for WF Event activity has a generic onUnhandledEvent that tests the current event against the value that was passed to the events table. If they match, the Wait for WF Event moves the workflow forward.</td>
<td>Triggered in the current thread or from a script include</td>
<td>The onUnhandledEvent of the Wait for WF Event activity</td>
</tr>
</tbody>
</table>

**Workflow stages**

Workflows can indicate workflow progress by updating any field designated as a stage field.

For example, the Incident [incident] table has an Incident state field that indicates progress, but the service catalog uses the Stage field.

To indicate the workflow's progress through the possible stage values, the interface updates the Stage field selected in the workflow properties. Available fields depend on the table used by the workflow. If the field provides a choice list, then the choices are available as stage values for the workflow. If the field is a workflow field, it displays an icon to indicate the workflow's progress, as with the Service Catalog's Stage field.
After stages are added to the workflow, they can be assigned to each workflow activity. If an activity with an assigned stage is encountered when the workflow runs, the workflow engine assigns the stage to the record associated with the workflow context.

For workflows that use the Requested Item [sc_req_item] table, the stage field is automatically set to the Stage field of the table and cannot be changed. The stage state displayed for a workflow running on the Requested Item table is based on the state of the workflow activities.

- If an activity is active, then the stage is shown with the state of In progress.
- If an activity is in the Pending or Completed state, the stage reflects this state.
- If an activity is canceled, Request Cancelled appears in the Stage field. The "Cancelled" label set in the wf_stage table is a reserved word, and does not display in the Stage field.

How stage values are derived

Stage values are derived from various sources in the interface.

- **Note:** An updated method for managing workflow stages as a set is also available. For information about grouping and reusing stages, see *Workflow stage sets* on page 3281.

Stage values are derived from the following sources:

- Choices for Stage column: Choices defined for the column selected as the Stage column for the workflow.
- Default stages for table: Stages defined in the Stage Default [wf_stage_default] table for the table selected.
- Workflow-specific stages: Applied only to the workflow for which they were defined in the Workflow Stage [wf_stage] table.
- Stage values in existing records: Values from the designated Stage column in the table assigned to the workflow are inherited from existing records.

If the stage field for a workflow is the table column named Stage, then the progress of the workflow appears in any list view containing the Stage column.
Stage values shown in the list views are accompanied by the state, based on the workflow activities being executed. If an activity has a stage specified for it, and the activity is currently active in the workflow, then the stage is shown with a state of In progress. Similarly, if the activity is in the Pending or Completed state, the stage reflects this state.

Example

If the workflow table is Request Item [sc_req_item], then the stage field is automatically set to the Stage column of that table and cannot be changed. The following stage values for the request item are displayed in a choice list from the Dictionary Entry [sys_dictionary] table:

- Waiting for Approval
- Fulfillment
- Delivery

In addition, the Request Item table has the following default stages:

- Request Cancelled
- Completed
Note: If an activity is cancelled, Request Cancelled appears in the Stage field. The "Cancelled" label set in the wf_stage table is a reserved word, and does not display in the Stage field.

When you edit available activity stages in the Workflow Editor, the list displays the following stage values:

- Waiting for Approval
- Fulfillment
- Delivery
- Request Cancelled
- Completed

The following diagram depicts the process used to gather stage values from the Request Item table to populate the Stages list in workflow activities.
Note: If you are creating a workflow with a table other than Request Item `[sc_req_item]`, you must select a Stage field in the workflow properties for the workflow to have stages.

Use workflow stages

You can add or modify workflow stages.

Role required: workflow_admin, workflow_creator, or admin

1. Navigate to Workflow Workflow Editor.
2. Create a new workflow by clicking New or open an existing workflow.

3. In the Workflow Properties form, if the table is not the Requested Item [sc_req_item] table, select a field to display stages in the Stage field property.

   Available fields depend on the table selected for the workflow.

4. After assigning a list of stages to the workflow, you can set a stage value in any of the workflow activities that provide a Stage field in their dialog box.

   Setting a stage value in a workflow activity tells the workflow engine to assign that stage to the record associated with the workflow context when the activity is encountered during a run.

   When an activity starts with a specified stage, the platform updates the Stage field with the current value. In workflows run against the Requested Item [sc_req_item] table, the sc_req_item.stage field is defined as a workflow type field.

   When displaying the stages for a workflow on the Requested Item [sc_req_item] table, the stage state is based on the state of the workflow activities. If an activity has a stage specified for it, and the activity is currently active in the workflow, then the stage is shown with an In progress state. Similarly, if the activity is in the Pending or Completed state, the stage reflects this state.

5. To edit the workflow-specific stages for an existing workflow, click the gear icon in the header bar and select Edit Stages. Again, these stage values are combined with the choices, defaults, and existing values.
Workflow stages

To optimize the use of stages, you can assign a stage to multiple activities in a workflow. For example, if your workflow uses the following activities to create tasks:
1. Get approval
2. Order equipment
3. Receive equipment
4. Add equipment to CMDB
5. Set up equipment
6. Install software
7. Configure software
8. Deliver to user

The following stages might be used:
- Approval
- Order
- Configure
- Deliver

A good practice is to assign stages to the activities as follows:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Assigned stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Get approval</td>
<td>Approval</td>
</tr>
<tr>
<td>Order equipment</td>
<td>Order</td>
</tr>
<tr>
<td>Receive equipment</td>
<td>Order</td>
</tr>
<tr>
<td>Add equipment to CMDB</td>
<td>Order</td>
</tr>
<tr>
<td>Set up equipment</td>
<td>Configure</td>
</tr>
<tr>
<td>Install software</td>
<td>Configure</td>
</tr>
<tr>
<td>Configure software</td>
<td>Configure</td>
</tr>
<tr>
<td>Deliver to user</td>
<td>Deliver</td>
</tr>
</tbody>
</table>

When the Order equipment, Receive equipment, or Add equipment to CMDB activity is active, the Stage display shows that the Order stage is In progress.

Add and translate stages

You can add default stages to use for a table, and stages to existing workflow

Add default stages for a table

You can assign a stage set as a default set to any number of tables.

The stages in the assigned stage set pre-fill the workflow version stages when you create a new workflow for the associated table.

1. Navigate to Workflow Default Stages (by table).
2. Click New.
3. Select a stage Set.
   You can create a new set by clicking New, typing a name, and clicking Submit.
4. Select a corresponding Table.
5. Click Submit.
   The stages in the selected stage set are automatically added to any new workflows that use the corresponding table.

Add a stage to an existing workflow
If a stage required for a workflow has not been imported or is not in the stage set assigned to the workflow table, you can add it to the workflow manually.
1. Navigate to Workflow Workflow Editor.
2. Open and check out the workflow.
3. In the title bar, click the menu icon and select Edit Stages.
4. In the Workflow Stages list, click New.
5. On the Workflow Stage form, fill in the fields as appropriate.
   Do not use a Name or Value field value that already exists in the base system.

Table 1255: Workflow stage fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The name of the stage as it appears in workflow fields.</td>
</tr>
<tr>
<td>Value</td>
<td>The value of the stage when it is referenced from elsewhere in the system, such as in a script.</td>
</tr>
<tr>
<td>Duration</td>
<td>The default duration for the stage. Currently not used.</td>
</tr>
</tbody>
</table>

6. Click Submit.
7. Publish the workflow.

Add a stage to a workflow activity
After stages are added to a workflow, you can assign them to the workflow activities.
1. Navigate to Workflow Workflow Editor.
2. Open and check out the workflow.
3. Double-click the activity.
4. In the Stage field on the Activity Properties form, find and select the stage to display when the workflow reaches the activity.
5. Click Update.

Translate workflow stages
You can provide translations for workflow stage names so the names appear in the language selected for the instance.

The instance must already have Internationalization support installed.

Language-specific text appears in workflow fields displayed in a list, workflow stage sets, and the Workflow Editor for users with that language selected. Language-specific text does not automatically appear when
displaying stages on a form. To translate stages on a form, add translated text to the workflow field choices.

You can add translated text for any language enabled on the instance. For example, to translate workflow stages into French:

1. Set the interface language to French.
2. Navigate to Workflow Workflow Editor.
3. Open and check out a workflow.
4. In the title bar, click the menu icon and select Edit Stages.
5. Edit the Name field for each stage and enter the text to display to French users.
   Do not change the Value field.
6. Confirm that the workflow stages display the French text.

Alternatively, to translate stages for multiple workflows at once, you can directly edit the Workflow Stages [wf_stage] table. For example, to translate workflow stages from multiple workflows into French:

1. Set the interface language to French.
2. In the application navigation filter, enter wf_stage.list.
3. Edit the Name field for each stage and enter the text to display to French users. Do not change the Value field.

Workflow stage sets

Stage sets are named groups of workflow stages commonly used together. Create a stage set and assign it as a default set to any number of tables. You can import the choice list values of a workflow field as stages for a workflow, and export a stage set to create a new one.

A single stage set usually represents a process, such as the stages required to display the progress of a service catalog request. You can also assign a stage set as the default set for workflows on specific tables.

In an active context, workflow stages provide summary-level feedback about the progress of a workflow. Stage icons display the status of each activity as it is being driven by a workflow. The system updates a Stage field, defined in the workflow properties, to indicate the progress of the workflow through the possible stage values.

Updates to workflow stage values

During an upgrade, the system makes changes to the Value field of records in the Workflow Stage [wf_stage] table.

- All entries are made lowercase.
- All spaces and special characters are replaced with underscores.

These changes support Localization settings and enable workflows to display translated text in the Stage field.

Create a new stage set

You can create a new stage set by creating a stage set record and adding stage set entries manually.

Create a stage set record only when you want additional stages that are not available on the table by default.

1. Navigate to Workflow Stage Sets.
2. Click New.
3. Enter a Name that indicates the purpose of the stage set. For example, you can create a Requested Item stage set to hold the stages commonly used by inventory tracking workflows or service catalog fulfillment workflows.

4. Click Submit.

5. Open the new stage set record.

6. In the Stage Set Entries related list, click New.
   Each stage set entry can be used as the Stage for an activity in a workflow that uses this stage set.

7. Enter a Name that indicates the stage name to appear in workflow fields.

8. Enter a Value to use when referencing the entry, such as in a script.

9. Click Submit.

10. In the Stage Set Entries related list, ensure that each entry has a unique Order value.
    Enter a low value for stages that should appear early in the workflow and a higher value for later stages.

The stage set can be added to a workflow or assigned as the default stage set for workflows that are created for a specific table.

*Use a default stage set*
You can assign a stage set as a default set to any number of tables.
The stages in the assigned stage set pre-fill the workflow version stages when you create a new workflow for the associated table.

1. Navigate to **Workflow Default Stages (by table)**.
2. Click New.
3. Select a Table.
4. Select the Set you want to assign to the selected table.
5. Click Submit.

**Import stages from a choice list**
You can import the choice list values of a workflow field as stages for a workflow.

Create a choice list as follows:

- Add a custom field of Type Workflow to the table.
- Configure the custom field to use a choice list.
- If you are creating a new field, set the Choice List type to Display without --None-- and create the choices for the newly created field.

For more information, see *Create a workflow stage field* on page 3284.

1. Navigate to **Workflow Workflow Editor**.
2. Open and check out the workflow.
3. In the title bar, click the menu icon and select Properties.
4. In the Workflow Properties dialog box, click the Stages tab.
5. From the Stage field list, verify that the correct workflow field is selected.
6. In the Related Links section, click Import Stages from Choice List.
7. In the dialog box asking you to confirm that you want to import the choice list, click OK.
8. Click Update.

The stage set can be added to a workflow or assigned as the default set for workflows that are created for a specific table.

**Export a stage set from a workflow**
You can create a new stage set by exporting the stages from an existing workflow as a set, instead of manually adding stage set entries to a stage set record.

1. Navigate to **Workflow Workflow Editor**.
2. Open and check out the workflow containing stages that you want to export as a new stage set.
3. In the title bar, click the menu icon and select Edit Stages to open the Workflow Stages dialog box.
4. In the Related Links section, click Export to Stage Set.
5. Enter a unique Name for the new stage set.
6. Click OK.

The stage set can be added to a workflow or assigned as the default set for workflows that are created for a specific table.

**Add a stage set to a workflow**
You can add any number of stage sets to an existing workflow.

When multiple stage sets have stage set entries with the same Value, the stage appears on the workflow only once.

1. Navigate to **Workflow Workflow Editor**.
2. Open and check out the workflow.
3. In the title bar, click the menu icon and select Edit Stages to open the Workflow Stages dialog box.
4. In the Related Links section, click Import from Stage Set.
5. Select the stage set.
6. Click Ok.
7. Import additional stage sets as needed for the workflow.

After you add all necessary stage sets to the workflow, you can add them to the workflow activities. For more information, see *Add a stage to a workflow activity* on page 3280.

**Create a workflow stage field**

Workflows can provide a summary of workflow progress by updating any field of the Workflow type. If the field is a workflow field, it displays an icon to indicate the workflow stage progress.

**Role required:** admin

In a form, the workflow field displays the current stage as a choice list value.

In a list, the workflow field displays stage icons that represent the series of states, stages, phases, or tasks within a workflow. The stage icons are populated using the activity stages from the associated workflow. For more information, see *Workflow stages* on page 3273.

To create a workflow stage field:

1. Navigate to *Workflow Default Stages (by table)*.
2. Right-click near a column header and select *Configure List Layout*.
3. Create a new field in lower right.
4. On the form view of the table used by the workflow, create a field with the Type set to Workflow.
   For detailed steps, see *Add and customize a field in a table*.
5. Click Save.
6. Right-click the field label and select *Configure Dictionary*.
7. Open a dictionary entry.
8. In the Choice List Specification section of the Dictionary Entries form, select Dropdown with --None-- from the Choice list.
9. Click Update.
10. To ensure that the workflow field properly displays stages on the form, define a choice for each workflow stage.
   - To create workflow stages using a choice list that already has choices, you can import the stages from the choice list. A stage is created for each choice defined for the Stage field selected in the workflow properties. For detailed steps about importing a choice list, see *Import stages from a choice list* on page 3283.
   - The Value of each choice must match the Value of the corresponding workflow stage.
   - Do not use spaces in the Value field for either choices or stages. Use underscores in place of spaces.
   - Make the choice list read-only. If a user changes the stage value for a record from the choice list rather than allowing the workflow to control the value, the workflow-driven, legacy, and linear renders may not work as intended. You can also use business rules or events to ensure the workflow progresses accordingly.

   For detailed steps on defining choice lists, see *Define an option for a choice list*.

11. To see workflow stages as icons, add the field to the list layout of the workflow table.

   For detailed steps, see *Configure the list layout*.

After you create or update the workflow field:

- Unless the workflow uses the Requested Item [sc_req_item] table, ensure that the workflow field is selected from the Stage field list in the workflow properties. For detailed steps, see *Select a stage field* on page 3285. If a workflow uses the Requested Item table, the stage field is automatically set to the Stage field of the table and cannot be changed.
- Work through the workflow. Any other updates made to the workflow field, such as updates from business rules or other scripts, can interfere with displaying workflow stages.

*Select a stage field*

A Stage field allows the workflow context to show additional workflow information, such as the stage name and the estimated completion time for an activity.

Ensure that the workflow field you want to use as the stage field is configured to properly display stages. For detailed steps, see *Create a workflow stage field* on page 3284.

Unless the workflow uses the Requested Item [sc_req_item] table, you can specify which field from the workflow table is the stage field. For workflows that use the Requested Item [sc_req_item] table, the stage field is automatically set to the Stage field of the table and cannot be changed.

To add or edit a workflow stage field:

1. Navigate to Workflow > Workflow Editor.
2. Create or check out the workflow.
3. In the title bar, click the menu icon and select Properties.
4. In the Workflow Properties dialog box, click the General tab.
5. In the Table list, verify that the table containing the workflow field is selected.
6. Click the Stages tab.
7. From the Stage field list, select the workflow field.
8. Click Update.

*Display approvers in workflow stage fields*

Enable workflow stage fields to display approvers, change the number of approvers to display, or disable displaying approvers.

Role required: admin
By default, only workflow stage fields that use the Workflow-driven renderer can display a list of approvers. Only these workflow stage renderer types support displaying approvers.

- Linear renderer
- Main flow renderer
- Workflow-driven renderer

1. Navigate to Workflow Administration Properties. The system displays the Workflow Properties page.
2. Set the following properties.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
</table>
| Number of approvers to show if approvers are displayed for workflow stages. Only valid for supported list v2 renderers. glide.workflow.renderer.show_approver_limit | Sets the maximum number of approvers to display within a workflow stage field. The system displays an ellipsis character when there are more approvers than the display limit allows.  
  - Type: integer  
  - Default value: 5 |
| Show approvers when displaying workflow stages with the Linear renderer. glide.workflow.renderer.linear.show_approval | Enables (true) or disables (false) the Linear renderer to display approvers.  
  - Type: true | false  
  - Default value: false |
| Show approvers when displaying workflow stages with the Main flow renderer. glide.workflow.renderer.mainflow.show_approval | Enables (true) or disables (false) the Main flow renderer to display approvers.  
  - Type: true | false  
  - Default value: false |
| Show approvers when displaying workflow stages with the Workflow-driven renderer. glide.workflow.renderer.workflowdriven.show_approval | Enables (true) or disables (false) the Workflow-driven renderer to display approvers.  
  - Type: true | false  
  - Default value: true |

3. Click Save.
4. Add stages to workflows that have associated workflow stage fields.

   **Note:** If you add stages to a subflow, the parent workflow must also have stages.

5. For each approval activity you want to display approvers, select a Stage value. For example, the sample workflow Service Catalog Item Request has two approval activities. The first Approval - User activity has a Stage value of Dept. Head Approval. The second Approval - User activity has a Stage value of CIO Approval.

The workflow stage field renderers you enabled display approvers up to the approver display limit. For example, a Workflow-driven stage field displays up to five approvers when the workflow reaches an approval stage.
Workflow stage field icons and tooltips
A workflow stage field displays icons to indicate the workflow stage.
Based on the stage renderer selected for the workflow, these icons may display a tooltip with additional information.

Table 1256: Workflow field icons

<table>
<thead>
<tr>
<th>Icon</th>
<th>Workflow stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>◢▶</td>
<td>Current active step</td>
</tr>
<tr>
<td>◐</td>
<td>Approval pending</td>
</tr>
<tr>
<td>◔</td>
<td>Approval rejected</td>
</tr>
<tr>
<td>✔</td>
<td>Complete</td>
</tr>
<tr>
<td>◔</td>
<td>Late (Change/Request) or Canceled (Catalog)</td>
</tr>
<tr>
<td>◐</td>
<td>Skipped (Catalog only)</td>
</tr>
</tbody>
</table>

Stage tooltips
Based on the stage renderer selected for a workflow, workflow stage icons may display tooltips with detailed information about a stage.
<table>
<thead>
<tr>
<th>Renderer</th>
<th>Tooltip behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legacy</td>
<td>When a user points to a stage, the tooltip displays the name of the stage. In the expanded view, the activity status appears in parentheses next to the stage.</td>
</tr>
<tr>
<td>Renderer</td>
<td>Tooltip behavior</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Other renderers</td>
<td>When a user points to a stage, the tooltip displays the name of the stage. If the stage is a gated approval, the tooltip also shows the name of the approver. In the expanded view, the activity status appears in parentheses next to the stage.</td>
</tr>
</tbody>
</table>

If you do not want the approver’s name included in the tooltip, navigate to System Properties Service Catalog and clear the Show the current pending approver’s name in the stage widget mouseover check box.

![Tooltip Example](image)

Show the current pending approver’s name in the stage widget mouseover

- Yes
- No

**Figure 735: Property for displaying pending approver’s name**

*Workflow stage renderers*

Workflow stage renderers determine how a workflow displays stages in a workflow field.

There are multiple renderers available.
Note: Most workflows should use the workflow-driven renderer. This renderer is used by default for all workflows. Use a different stage renderer only after careful consideration and to satisfy specific requirements for how the stages appear.

**Workflow-driven**

Use the workflow-driven renderer as much as possible. This renderer displays icons for stages using the stage state controlled by the workflow. Icons are displayed in a way that is meaningful for many situations. This renderer can display stages from a main workflow and subflows. The order of the icons is determined by the expected path of the executing workflow. As the workflow progresses, stages on paths that the workflow did not take are removed from the display. Stages from paths other than the expected path are not included unless the workflow follows that path.

The Stage order field on the Stages tab has two options:

- Computed uses the actual workflow path in order
- User-specified uses the order specified in the Order column on the Workflow Stages record

Note: If the workflow context for a request item has been deleted, the stages for that request item can no longer be rendered. This stage history is stored on the workflow context.

**Main flow**

The main flow renderer displays icons for stages defined in the main workflow only. Use this renderer when you do not want to expose the details of the subflows. For example, a single main workflow may run several subflows to handle implementation details. The stages in these subflows do not provide useful information for the user who starts the workflow, but are useful when editing the subflow. In this scenario, using the main flow renderer leads to the best user experience. The stage field displays the high-level process of the workflow without exposing unnecessary details.

The Stage order field on the Stages tab has two options:

- Computed uses the actual workflow path in order
- User-specified uses the order specified in the Order column on the Workflow Stages record

**Linear**

Linear rendering displays all stage icons from the main workflow and all subflows within a single workflow field on a list or form. It displays icons in a linear sequence regardless of the paths the workflow follows as it executes. This renderer uses stages defined in both the main workflow and any subflows that the main flow launches. The icons appear in the user-specified order. Skipped stages do not appear.

Use this renderer when the workflow stages must display in a consistent order and the actual details of how the workflow runs are less important. For example, a workflow may revisit or revert to previous stages based on one or more *Condition Workflow activities* on page 3398. Displaying these loops in the stage field does not provide useful information to the user. In this scenario, using the linear renderer leads to the best user experience. The stage field displays the predefined process, including stages from subflows, in a consistent order.

For example, you can create a service catalog workflow that uses a subflow to complete delivery of the requested item. The following images illustrate the main flow and subflow for ordering corporate-branded supplies.
The linear renderer displays all these stages in one workflow field. The parent workflow specifies the Waiting for approval, Fulfillment, and Completed stages. The subflow specifies the Delivery and Waiting for Task, and Delivery OK stages.

**Progress bar**

The progress bar renderer displays a single progress bar instead of a sequence of stage icons. This renderer is particularly useful when you want to display the general progress of the workflow as a percent. Each stage in the workflow controls an equal percentage of the progress bar. For example, if a workflow has 10 stages, reaching each stage causes the workflow field to display an additional 10% of the progress bar. Stage names do not appear in the progress bar.
The progress bar renderer provides a way to display the status of a workflow that has a large number of stages. Other rendering options may provide a better user experience when rendering fewer than four stages in a single workflow.

The Stage order field on the Stages tab has two options:

- Computed uses the actual workflow path in order
- User-specified uses the order specified in the Order column on the Workflow Stages record

![Stage](image)

Figure 738: Workflow field progress bar

**Legacy**

The legacy renderer displays stages in the same way as releases prior to Dublin. When an instance is upgraded from a release prior to Dublin, all existing workflows are set to use the legacy renderer. Whenever possible, use a different stage renderer instead. If you want your workflow to maintain pre-Dublin behavior, use the Legacy option. The legacy renderer sometimes assigns incorrect data to and/or reports incorrect data from the workflow stage field. If possible, we recommend all workflows use the Workflow-driven renderer.

With the legacy renderer, you can create and reference a custom workflow field icon set by setting the icons attribute to a new script include. For example, to use the WorkflowIconsSCR script include to define which icons to use, add the attribute icons=WorkflowIconsSCR to the Attributes field of the dictionary entry for the workflow field. To use the default icon display behavior, use the attribute icons=WorkflowIconsStages.

The legacy renderer works with all tables except the Requested item [sc_req_item] table. In this case, use the requested item renderer instead.

**Requested item**

The requested item renderer functions the same way as the legacy renderer, but is for use with the Requested item [sc_req_item] table.

Select a stage renderer

In most cases, the default workflow-driven renderer should be used. If you have specific requirements for displaying stages, you can select a different stage renderer.

Consider the following when selecting a stage renderer:

- Use the workflow-driven renderer if possible. This is the default renderer that should be used in most cases.
- Use the legacy renderer only if your instance was upgraded from a release prior to Dublin and you want your workflow to maintain pre-Dublin behavior.

To use linear, main flow, or progress bar rendering, satisfy the following requirements.
## Table 1258: Linear and progress bar renderer requirements

<table>
<thead>
<tr>
<th>Renderer</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear</td>
<td>• The parent workflow and all subflows must modify the same current record.</td>
</tr>
<tr>
<td></td>
<td>• In the properties for all subflows, the Stage field value for all subflows must match that of the parent workflow.</td>
</tr>
<tr>
<td></td>
<td>• The parent flow and all subflows must contain the same stages. Use a stage set to ensure the parent flow and all subflows have the same stages.</td>
</tr>
<tr>
<td></td>
<td>• On the workflow canvas, each workflow needs only the stages used directly by that workflow. It is not necessary to add stages from subflows to activities on the parent flow, or stages from the parent flow to activities on the subflows.</td>
</tr>
<tr>
<td>Main flow</td>
<td>• The workflow contains subflows.</td>
</tr>
<tr>
<td></td>
<td>• You do not want or need to reveal the details about the subflows.</td>
</tr>
<tr>
<td>Progress bar</td>
<td>• The workflow properties must have a Stage ordering value of User-defined.</td>
</tr>
<tr>
<td></td>
<td>• There must be workflow stages within the workflow.</td>
</tr>
<tr>
<td></td>
<td>• Because stage names do not appear in a workflow field when using the progress bar renderer, you can simplify stage names to represent a percentage of the workflow. For example, if a process has four main steps, name the workflow stages as 25%, 50%, 75%, and 100%. Enter the numerical value of each stage, such as 25, in the Value and Order fields.</td>
</tr>
</tbody>
</table>

To select a stage renderer:

1. Navigate to Workflow Workflow Editor.
2. Open and check out the workflow.
3. In the title bar, click the menu icon and select Properties.
4. In the Workflow Properties dialog box, click the Stages tab.
5. From the Stage rendering list, select a stage renderer.
   - If you are using two workflows to update two unique workflow fields on a single record, both workflows must use a non-legacy renderer. You can select a different stage renderer for each workflow but do not select Legacy for either one.
   - If you want to use the linear renderer, make sure you select Linear in the properties for the parent workflow and all subflows.
6. Click Update.

Workflow fields with deleted records

Workflow fields may indicate when a record required by the workflow is deleted.

After a referenced record is deleted, the reference in the primary record is no longer valid. If the stage renderer detects a reference that is no longer valid, the stage field displays a message about the deleted record.

Administrators can restore deleted records. For more information, see Use the Deleted Records module to restore a deleted record.

Figure 739: Workflows with missing records

The image shows a list with two workflows. The top request does not have an associated request item. The bottom request has an associated request item, but the item does not have an associated workflow context.

Workflow validation

Workflow validation examines different characteristics of a workflow to locate issues that might prevent the workflow from being published or cause it to fail. The validation report summarizes the results of each separate workflow validation.

Validation prevents workflows with critical flaws from executing and resulting in an unstable or incomplete state. There are a number of validators in the base system that notify workflow designers of potential problems. For example, multiple End activities, disconnected transitions, incorrect table references, missing subflows, and dependencies affected by update sets. A workflow validation report displays the results from each validator, including a message explaining what was found. The system automatically validates a workflow when you publish it. You can also run validation on a workflow directly from controls in the Workflow Editor.

Highlighting critical errors

The graphical Workflow Editor highlights critical errors when a workflow is loaded. In this example, a subflow is missing and is not available to the parent workflow for the current user. The graphical Workflow Editor indicates the error when the parent workflow loads by highlighting (in red) the activity that calls the
subflow. To correct the error in the parent workflow, click the validate icon in the header bar and inspect the error description in the validation report.

![Workflow Diagram](image)

**Figure 740: Validate missing subflow**

**Validations at publishing**

If you attempt to publish an invalid workflow or a workflow with potential problems, the system displays an error message and blocks the operation, if necessary. When validation error messages appear, click the validate icon in the graphical Workflow Editor to see the error report.

**Validation warning**

A validation warning notifies you that a potential problem exists in a workflow but permits you to publish the workflow. Validation warnings appear when:

- You edit and then attempt to publish a workflow that is included as a subflow in another workflow. The system cannot determine how your changes will affect the parent workflow and alerts you of the relationship.
- A workflow activity uses a different table than the table assigned to the workflow. The system alerts you of the potential conflict.
Validation failure

A validation failure notifies you that a critical error has occurred in the workflow that prevents you from publishing the workflow. An example of a critical error is a missing subflow.

Workflow validation report

Validators display three notification levels: CRITICAL, WARN, and INFO. The designer can publish a workflow that returns WARN or INFO level validation, but not a workflow that returns an overall validation level of CRITICAL.
**Workflow Validation Report**

**Figure 743: Workflow validation report**

**Header summary**

The header of the validation report summarizes the entire validation run against the specified workflow.

- Validate Summary: The overall score reflects the most severe notification level encountered during the validation.
- Total checks performed: The total number of validations run is also broken down to show the number at each notification level.

**Report columns**

The body of the report displays the results of each individual validation check that was performed. The
columns are Type, Level, and Message. You can sort and filter these columns as you would any list.

Table 1259: Workflow termination and external dependencies levels

<table>
<thead>
<tr>
<th>Name</th>
<th>Implication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Info</td>
<td>Provides information about the current workflow version. An example of an information level message is one that names the lowest common table in the workflow. Workflows at this validation level are considered valid and publishable.</td>
</tr>
<tr>
<td>Warning</td>
<td>Alerts the user that the validator detected anomalies in the workflow that might compromise its ability to execute. An example of a warning level message is one that alerts you to a missing activity input transition. Workflows at this validation level are considered valid and publishable.</td>
</tr>
<tr>
<td>Critical</td>
<td>Names a workflow element containing a critical error that prevents the workflow from executing successfully. Examples of this are missing or invalid subflows and missing transitions. Workflows at this validation level cannot be published or run in production.</td>
</tr>
</tbody>
</table>

Message

The validation message provides a detailed description of the results, including table names, update sets, and other specifics.

For the procedure to validate a workflow and generate a validation report, see Validate a workflow on page 3236
Workflow validator

ServiceNow offers several workflow validators for workflow designers to test their workflows. This page lists all available workflow validators. See Workflow validation on page 3294 for information on using workflow validators and the workflow validation report to see the type of information that is returned.

### Table 1260: Hanging workflows and update sets

<table>
<thead>
<tr>
<th>Hanging Workflows</th>
<th>Update Sets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify workflow design decisions that can result in a hanging workflow</td>
<td>Identify related artifacts being moved in different update sets</td>
</tr>
<tr>
<td>ValidateTransitionOut on page 3299</td>
<td>ValidateUpdateSetDependencies on page 3310</td>
</tr>
<tr>
<td>ValidateTransitionIn on page 3301</td>
<td>ValidateUpdateSetParentDependencies on page 3312</td>
</tr>
<tr>
<td>ValidateDanglingTransition on page 3302</td>
<td>ValidateInputVarUpdateSetDependencies on page 3314</td>
</tr>
<tr>
<td>ValidateSubflows on page 3303</td>
<td></td>
</tr>
<tr>
<td>ValidateScriptForCurrentDotUpdate on page 3304</td>
<td></td>
</tr>
</tbody>
</table>

### Table 1261: Workflow termination and external dependencies

<table>
<thead>
<tr>
<th>Unexpected Workflow Termination</th>
<th>External Dependencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify workflows that can end unexpectedly</td>
<td>Identify external artifacts that have potential workflow dependencies</td>
</tr>
<tr>
<td>ValidateSingleEnd on page 3307</td>
<td>ValidateParentFlow on page 3307</td>
</tr>
</tbody>
</table>

### Table 1262: Workflow conflicts

<table>
<thead>
<tr>
<th>Workflow Properties Conflicts</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify workflow design decisions that conflict with workflow properties</td>
<td></td>
</tr>
<tr>
<td>ValidateLowestCommonTable on page 3305</td>
<td></td>
</tr>
<tr>
<td>ValidateTableChange on page 3306</td>
<td></td>
</tr>
</tbody>
</table>

**ValidateTransitionOut**

The ValidateTransitionOut validator finds activity conditions with no exit transitions.

**Validation summary**

- Risk: Activity conditions might not transition to the next activity, which could cause the workflow to hang.
- Severity Level: Warning
- Valid Result: Valid
- Valid Message: All conditions have transitions.
Troubleshooting

Design choices made when creating a workflow on the canvas might legitimately use an activity without an exit condition. In the first example, the Notification and Timer activities both execute at the start of the workflow. The Timer is the entity that decides when the workflow ends. In this situation, executing the Notification, but not transitioning away, keeps the design simple and adds no risk. The validator finds and reports the missing transition from the Notification activity as a Warning that the designer can ignore.

![Workflow Diagram](image)

**Figure 744: Condition with no valid transition**

In the second example, the Notification activity has no exit transition. The designer missed this because of the layout. The transition from the Timer activity passes behind the Notification activity and appears to connect the exit from the Notification activity to the End. In workflows with more than 10 or 15 activities, it might be difficult to see all the transitions clearly. This workflow's designer intended for the Notification activity to transition to the End.
Figure 745: No condition out

This validator directs the designer to the specific activity and condition that does not have an exit transition. The designer then makes the decision whether or not to respond to the warning.

*ValidateTransitionIn*

The ValidateTransitionIn validator finds activities that do not have inbound transitions and cannot execute in the workflow.

**Validation summary**

- **Risk:** Activities that do not have inbound transitions have no means of being executed in the workflow. If other logic builds from these activities, the workflow could hang, with no means of moving forward.
- **Purpose:** Find activities that do not have inbound transitions.
- **Severity Level:** Warning.
- **Valid Result:** Valid.
- **Valid Message:** All activities in this workflow have at least one inbound transition.
- **Invalid Result:** Invalid.
- **Invalid Message:** This workflow contains <activity count> activity conditions without an input transition.
- **Suggested Action:** Either remove the activities to reduce confusion and make the workflow easier to understand or provide the appropriate inbound transition.
- **Publishable:** Yes
- **Runnable:** Yes
- **Related Information:** None

**Troubleshooting**

Although the activities detected in this validator do no harm to the execution of the workflow, the designer needs to know that there are activities on the canvas that cannot execute and serve no purpose, particularly in a production system. This error is typically caused by a visual misinterpretation of the drawing.

This example workflow appears to be perfectly valid. Under closer inspection, however, we see that the transition from Set Values does not stop at Approval - User (there is no arrow end). Instead, that transition goes directly to End. As a result, Approval - User cannot execute. Because there is an activity in the workflow based on the approval’s condition routing, it appears that the designer intended for the approval to execute and that a correction is needed.
This validator directs the designer to the specific activity and condition that has no inbound transition. The designer should establish a transition or remove the activity.

**ValidateDanglingTransition**

The ValidateDanglingTransition validator finds and reports any transitions that do not terminate on an activity.

**Note:** These transitions are not drawn on the workflow canvas, but are still present in the database.

**Warning:** This is a critical error that prevents a workflow from running.

**Validation summary**

- Risk: A workflow with dangling transitions will silently hang a workflow with no recovery options.
- Severity Level: Critical
- Valid Result: Valid
- Valid Message: Valid
- Invalid Result: Invalid
- Invalid Message: Invalid
- Suggested Action: Remove or connect the offending transition. Get the source activity name from the validation report details and resolve the issue. Then, run the validation again to test your changes.
- Publishable: No
- Runnable: No
- Related Information: None
Troubleshooting

On rare occasions, the destination of a workflow transition becomes null. The workflow canvas shows no evidence of the transition, but at run time, the workflow hangs when it encounters one of these dangling transitions. If the ValidateDanglingTransition validator reports this condition at publishing time, it blocks the publication action until the issue is resolved. If this condition is detected on a runtime check, the workflow is not allowed to execute against a current record's transaction. Instead, the system adds a critical log entry detailing the activity with the faulted transition to the current record's workflow context. To enable the workflow to execute on the next appropriate transaction, remove the faulted transition from the workflow model.

To find and remove the faulted transition:

1. Make note of the workflow version and activity that contains the faulted transition as indicated in the validator details.
2. Navigate to Workflow Administration Workflow Version.
3. In the list of workflow versions, select the workflow that has the faulted transition.
4. On Workflow Version form, add the workflow activities related list. Click the menu icon, select Configure > Related Lists, move Workflow Activity-->Workflow Version from the Available list to the Selected list, and click Save.
5. In the Workflow Activities related list, select the activity cited in the validator.
6. In the Workflow Activity form, view the Workflow Transitions section or tab and identify the transition in that list that has no value or a null value in the To column.
7. Delete this transition.
8. Return to the workflow version and re-run the validation check.

The Critical warning should disappear. The workflow should execute as expected on the next appropriate transaction.

ValidateSubflows

The ValidateSubflows validator detects any workflows included as subflows that are either inactive, deleted, or not available as a published workflow for the current user.

Any of these conditions cause the workflow to hang when the workflow activity in the main flow is encountered.

**Warning:** This is a critical error that prevents a workflow from running.

Validation summary

- **Risk:** A parent workflow that transitions to a deleted subflow hangs indefinitely, with no recovery options.
- **Severity Level:** Critical
- **Valid Result:** Valid
- **Invalid Result:** Invalid
- **Valid Message:** This workflow contains <count> valid subflows.
- **Invalid Message:** This workflow contains <invalid count> invalid subflow(s) of <total subflow count> total subflows.
- **Suggested Action:** Remove the link in the parent workflow to the questionable subflow, examine the subflow to ensure that it is valid and published, or that it is checked out to the current user. After making the correction to the state of the subflow, run the validation again to test your changes.
• Publishable: No
• Runnable: No
• Related Information: Workflows used as subflows on page 3240

Troubleshooting

When a workflow runs, regardless of whether it is a subflow or a main flow, the script engine determines which version of a workflow should execute, given the current user and workflow conditions. When a workflow is checked out by the same user who is running the workflow, the checked out version is the version that executes. If the user is not the same person who has the workflow checked out, the published version of the workflow executes. If there is no published workflow, no workflow runs.

One scenario addressed by the ValidateSubflows validator is when a workflow:

• Is checked out to User A.
• Is a subflow in a parent workflow being run by User B.
• Has no published alternative to the subflow being run by User B.

When this occurs, the parent workflow runs to the execution of the unpublished subflow and then hangs at that activity, with no means to transition forward. Main flows that encounter this condition in a subflow are not permitted to execute against a current record's transaction. Instead, a critical log entry detailing the subflow's state is added to the current workflow's Workflow Context record. To correct the problem, remove the subflow from the main flow, or publish the subflow so it is available to User B. This allows the workflow to execute on the next appropriate transaction.

Another scenario addressed by the ValidateSubflow validator is when a workflow:

• Is a subflow in a parent workflow being run by any user.
• Has no published alternative to the subflow, because the workflow has been deleted or all versions of the workflow are unpublished or inactive.

Note: You cannot delete a from a list or form workflow that is a subflow. However, you can create one of these unstable conditions with advanced scripting, SQL options, or incomplete update sets that contain main flows, but not the referenced subflows. When troubleshooting a workflow that triggered this validator, consider the history of the subflow while assessing the error condition.

ValidateScriptForCurrentDotUpdate
The ValidateScriptForCurrentDotUpdate validator finds workflow activities with scripts that use the current.update() function.

Calling current.update() causes significant performance delays in transaction processing and might cause an instance to hang.

Validation summary

• Risk: At best, a workflow that uses current.update() in scripts experiences degraded performance. In the worst case, the workflow enters an infinite, recursive loop that crashes the server.
• Severity Level: Warning
• Valid Result: Valid
• Valid Message: The JavaScript in this workflow has no instances of 'current.update()'.
• Invalid Result: Invalid
• Invalid Message: This workflow uses 'current.update()' in <count of current.update references> JavaScript statements.
• Suggested Action: Remove current.update() from the activity scripts cited by this validator. Workflows execute within a transaction, and current is updated, or possibly inserted, at the end of the transaction, as appropriate. There is no need to explicitly update the record during the transaction.

• Publishable: Yes
• Runnable: Yes

Problems with current.update() in workflow scripts

A workflow initiates execution in one of these ways:

• Script Engine: If a workflow is assigned to a specific table, and given a run condition, the workflow runs on INSERT.
• Script: Any business rule, script include, background script, or client script can initiate a workflow using the workflow script include and calling startFlow().

The workflow engine initiates a workflow based on the matched criteria of the current record being inserted. The transaction for current is managed by the script engine and not the workflow. Workflows that progress on the update() of the current record are not invoked via the workflow engine, but as a call from either a client script or business rule. In either case, the script engine is invoked, and the current record is put in memory. Edits and modifications to any current fields are made and are available to other activities and scripts that are executed in the same transaction.

When appropriate, other engines that run in sequence with the workflow engine, such as the business rule engine or field normalization, are invoked against the same current record transaction. Any changes made to current through these scripts and activities modify the record in memory. These changing values are available for reference in any other transactions called from activities and scripts in the same INSERT transaction. When all expected changes are executed, the current record is inserted.

When one of these scripts calls current.update() on a record that has yet to be inserted, the action forces an unnecessary and error-prone database transaction. If a record is not yet in the database, it cannot be updated. Business rules that trigger on update() on a record that is in the process of being inserted can cause a very unstable and potentially infinite looping condition.

Troubleshooting

This validator detects the use of current.update() in any of the editable script fields. Do not call current.update() from within a workflow script. In the event of an INSERT or UPDATE of current, the changes made to current are available to all scripts executing in the same transaction, and the script engine stores all changes in the database. Leave the update of current to the engine. Use the scripts only for setting and referencing the current field values.

ValidateLowestCommonTable

The ValidateLowestCommonTable validator reports the lowest table in the Glide hierarchy that the workflow uses.

For example, the Requested Item [sc_req_item] table is the lowest table in a workflow containing a Catalog Task activity. This information is significant to a designer who wants to change the table against which an existing workflow runs after adding activities to the canvas.

Note: This validator provides information only. It does not indicate an error or warning condition.
Validation summary

- Risk: This validator informs only and has no risk associated with it.
- Severity Level: Data/Information
- Valid Result: Valid
- Valid Message: The lowest common table in this workflow is <table_name>.
- Invalid Result: N/A (informational only)
- Invalid Message: N/A (informational only)
- Suggested Action: None
- Publishable: Yes
- Runnable: Yes
- Related Information: Tables and classes, Workflow activities on page 3367

ValidateTableChange
The ValidateTableChange validator reports any activities in the workflow that are invalid given the table associated with the workflow version.

For example, a workflow version that is associated with the Change Request [change_request] table but has a Catalog Request activity on the canvas is invalid, since the activity is not compatible with the selected table.

Validation summary

- Risk: If the current record at runtime does not originate from the table specified by the lowest common table, the activities for the lowest common table cannot set specific values.
- Severity Level: Warning if the table that is associated with a workflow is higher in the table hierarchy than the lowest common table required for the workflow activities.
- Valid Result: Valid
- Valid Message: All activities are valid for the newly selected table
- Invalid Result: Invalid Activity
- Invalid Message: This workflow contains <count of invalid activities> invalid activities for the newly selected table.
- Suggested Action: Make one of these changes:
  - Change the workflow to not require the activities associated with the lowest table reported.
  - Modify the workflow to use a table that contains the lowest common table in its hierarchy.
  - Ensure that the current record meets the requirements of the at-risk activities.
- Publishable: Yes
- Runnable: Yes
- Related Information: Workflow activities on page 3367

Troubleshooting

Navigate to Workflow Administration Activity Definitions. Note the Table column in the list. Each activity that is not global is associated with a table.

When you select a table in the Workflow Properties form, the activity menu presents only activities that are compatible with the selected table. Associating a table with a workflow activity enables the system to make certain decisions about the activity that affect value comparison, condition routing, or the setting and getting of field values in the current record.
When a workflow is set to the Global [global] table, it is possible that the process executing the workflow ensures that the current record meets the requirements of the activities identified by this validator. In that case, the activity still works as expected. If that assurance cannot be guaranteed by the user process, do not use the activity identified by the validator without assigning a table that meets the requirements of all the activities on the canvas.

This validation check ensures that the table specified by all the activities in a particular workflow is included in the hierarchy of the table selected for the workflow.

**ValidateParentFlow**
The ValidateParentFlow validator reports any workflows that use the workflow as a subflow.

**Validation summary**

- Risk: There is no risk in a workflow being a subflow. This is only a warning that other workflows are at risk from dramatic changes to a subflow.
- Severity Level: Warning
- Valid Result: Valid
- Valid Message: Currently `<workflow version name>` is not a subflow.
- Invalid Result: None
- Warning Message: This workflow version (`<workflow version name>`) is required as a subflow in `<workflow version count>` other workflows.
- Suggested Action: Exercise caution when modifying things like input parameters and return values to assure that parent workflows are not adversely affected.
- Publishable: Yes
- Runnable: Yes
- Related Information: Workflows used as subflows on page 3240

**Troubleshooting**

The system warns the workflow designer at publishing time and during validation that a workflow is a subflow. This warning reminds the designer that changes to the current workflow have the potential to affect workflows cited in the validation report or other workflows already running in production. Regardless of how simple the change to a workflow that is a subflow, thoroughly test all parent flows cited in this validation report before publication.

When a workflow is a subflow, changes that can cause it to become invalid include:

- Changing the data types of input variables. Verify that all parent workflows cited in this validation report can pass the correct value type.
- Adding input variables. Verify that all parent workflows cited in this validation report are able to pass all variable values into the subflow.
- Changing or removing the return value of a workflow. Verify that any changes to the return value of a workflow are compatible with the requirements of all the parent flows.
- Changing the table on which the workflow runs. Verify that the table selection is compatible with all parent flows.

**Note:** To delete a workflow that is a subflow, first remove the dependency by removing the subflow from all parent flows cited in this validation report. After the dependencies are cleared, a user with the proper role can delete the subflow.

**ValidateSingleEnd**
The ValidateSingleEnd validator finds and identifies multiple End activities in a single workflow.
Multiple End activities in a workflow might be intentional and have no affect on the workflow, or might be a mistake that the designer needs to correct.

Validation summary

- Risk: If the execution paths to the End activities are not mutually exclusive, then the first End encountered completes the workflow and cancels all other executing activities.
- Severity Level: Warning
- Valid Result: Valid
- Valid Message: This workflow contains 1 End activity.
- Invalid Result: Invalid Activity
- Invalid Message: This workflow contains <count of ends> End activities.
- Suggested Action: Remove extraneous End activities that are not intended as part of the design.
- Publishable: Yes
- Runnable: Yes
- Related Information: None

Troubleshooting

As soon as an End activity is encountered in the workflow, the workflow completes even if there are other viable execution paths leading to a second End activity that is still executing. Those executing activities are canceled as part of the End activity's clean up actions. Therefore, the results of designing workflows with multiple Ends must be carefully considered.

In the case of large workflows, it is often more intuitive to read the workflow when there are multiple End activities. In the following example, the paths to the two Ends are mutually exclusive execution paths. If this was a large workflow, with many activities between Branch and the second End, the value of the multiple ends becomes apparent. Tracing a No response from User is invalid to a single End behind 33 other activities would be significantly more difficult. There is no risk in this workflow design because there is no reason for other activities to execute if the End after the Notification activity terminates the workflow.
Figure 747: Mutually exclusive execution paths

The next example has multiple End activities in execution paths that are not mutually exclusive. A Yes response from User is valid causes the Set Values activity to finish immediately. By reaching its End activity first, this execution path cancels the Approval for Apps and the DB Task activities, which might not be the desired outcome. If the paths are all expected to complete before End, the activities should come to a Join (as in the previous example) that transitions to a single End.
Figure 748: Mutually inexclusive execution paths

**Note:** To add the second End, right-click to copy the original End activity and paste it onto the canvas. In most cases, a single End is the best and most reliable way to ensure that all activities expected to execute prior to workflow completion, do so successfully.

---

**ValidateUpdateSetDependencies**

The ValidateUpdateSetDependencies validator identifies all the subflows called in the current workflow and determines if any of those subflows are being edited in a different (in progress) update set.

This warning informs the user that this workflow and one or more of its dependencies are being actively modified in a way that will not deploy concurrently to another instance without additional effort.

For information about update sets, see [Create and select an update set](#).

---

**Validation summary**

- **Risk:** If a parent workflow is edited in one update set and its dependent subflow is edited in another, the two workflows might not be compatible when moved to a different instance. Making independent changes, such as to common or expected values, can make the two workflows incompatible.
- **Severity Level:** Warning
- **Valid Result:** Valid
- **Valid Message:** There were no Update Set dependency issues found.
- **Invalid Result:** Invalid
• Invalid Message: This workflow has dependent workflows that are in a different update set.
• Suggested Action: Modify and deploy both workflows in the same update set. If you must modify dependencies in separate update sets, use one of these methods:
  • Ensure that all update sets migrate concurrently.
  • Prior to deploying the main flow update set, merge the dependencies into one update set before completing that update set.

• Publishable: Yes
• Runnable: Yes
• Related Information: Workflow movement with update sets on page 3337

Troubleshooting

A workflow is added to an update set only when the workflow is published. This validator issues a warning when either of the following conditions exist:

• A published subflow is in a different update set than the parent workflow and that update set is In progress.
• A subflow is checked out by another user, who is working in a different update set than the current user.

Note: This validator does not look for update sets that have been closed. It looks only at update sets that are In progress or at the update sets of all subflows being used by the current workflow that are checked out to users who are working in a different update set.

Example

Following is an example of an at-risk development scenario in which two users create dependencies between workflows in different update sets.

User A:
1. Sets Update Set A to the current update set.
2. Checks out Workflow A.
3. Changes the return value of the String type in Workflow A to a Reference/User type.
4. Publishes Workflow A, causing an entry into Update Set A.

User B:
1. Sets Update Set B to the current update set.
2. Checks out Workflow B.
3. Includes Workflow A as a subflow.
4. Uses the user reference return value from Workflow A as an approval assignment.
5. Publishes Workflow B, causing an entry into Update Set B.
Risks

- User B moves Update Set B to a different instance that has an older version of Workflow A. The return value is not a user reference, which causes the outcome of Workflow B to be different than it was when tested in development.
- User B moves Update Set B to a new instance that does not have a version of Workflow A. Workflow B experiences a validation failure at runtime and cannot execute. A log entry is added to the workflow log of the current record.

Possible solutions

Solution 1
Migrate the parent workflow and all dependent workflows to a new instance together using the same update set.
1. Set the update set to the one you want to migrate to new instances.
2. Check out and republish the workflows that need to be included.
   • This action forces an entry into the current update set.
3. Complete the update set with all dependencies.
4. Follow standard procedures for migrating update sets to local instances.

Solution 2
Move dependent workflows between update sets.
1. Identify the update set containing the main workflow to be migrated.
2. Navigate to System Update Sets > Local Update Sets.
3. Find and select the update set that contains the dependencies to the main workflow.
4. In the Customer Updates related list, select the workflow version of the subflow you want to move.
5. Select the update set containing the parent workflow in the Update set field.
   • If this field is not on the Customer Update form, configure the form and add the field.
6. Click Update.
   • The base system moves the dependent subflow to the update set selected.
7. Repeat steps 4-6 to add additional dependent subflows to the parent flow update set.

ValidateUpdateSetParentDependencies
The ValidateUpdateSetParentDependencies validator identifies all the workflows that call the current workflow as a subflow and determines if any of those parent workflows are being edited in a different update set that is in progress.

This warning informs the user that this workflow and one or more workflows that depend on this workflow are being actively modified in a way that will not deploy concurrently to another instance without additional effort.
Validation summary

- **Risk:** If a parent workflow is edited in one update set and its dependent subflow is edited in another, the two workflows might not be compatible when moved to a different instance. Making independent changes, such as editing common or expected values, can make the two workflows incompatible.
- **Severity Level:** Warning
- **Valid Result:** Valid
- **Valid Message:** There were no Update Set dependency issues found.
- **Invalid Result:** Invalid
- **Invalid Message:** This workflow has dependent workflows that are in a different update set.
- **Suggested Action:** Modify and deploy both workflows in the same update set. If you must modify dependencies in separate update sets, use one of these methods:
  - Ensure that all update sets migrate concurrently.
  - Prior to deploying the main flow update set, merge the dependencies into one update set before setting that update set to complete.
- **Publishable:** Yes
- **Runnable:** Yes
- **Related Information:** Workflow movement with update sets on page 3337

Troubleshooting

A workflow is added to an update set only when the workflow is published. This validator issues a warning when either of the following conditions exist:

- A published subflow is in a different update set than the parent workflow and that update set is In progress.
- A subflow is checked out by another user, who is working in a different update set than the current user.

**Note:** This validator does not look for update sets that have been closed. It looks only at update sets that are In progress or at the update sets of all parent workflows that call the current workflow and are checked out to users who are working in a different update set.

Example

Following is an example of an at-risk development scenario in which two users create dependencies between workflows in different update sets.

**User A:**

1. Sets Update Set A to the current update set.
2. Checks out Workflow A.
3. Changes the return value of the String type in Workflow A to a Reference/User type.
4. Publishes Workflow A, causing an entry into Update Set A.

**User B:**

1. Sets Update Set B to the current update set.
2. Checks out Workflow B.
3. Includes Workflow A as a subflow.
4. Uses the user reference return value from Workflow A as an approval assignment.
5. Publishes Workflow B, causing an entry into Update Set B.

**Risks**

- User B moves Update Set B to a different instance that has an older version of Workflow A. The return value is not a user reference, which causes the outcome of Workflow B to be different than it was when tested in development.
- User B moves Update Set B to a new instance that does not have a version of Workflow A. Workflow B experiences a validation failure at runtime and cannot execute. A log entry is added to the workflow log of the current record.

**Possible solutions**

**Solution 1**
Migrate the parent workflow and all dependent workflows to a new instance together using the same update set.
1. Set the update set to the one you want to migrate to new instances.
2. Check out and republish the workflows that need to be included.
   - This action forces an entry into the current update set.
3. Complete the update set with all dependencies.
4. Follow standard procedures for migrating update sets to local instances. For information about update sets, see [System update sets](#).

**Solution 2**
Move dependent workflows between update sets.
1. Identify the update set containing the main workflow to be migrated.
2. Navigate to System Update Sets Local Update Sets.
3. Find and select the update set that contains the dependencies to the main workflow.
4. In the Customer Updates related list, select the workflow version of the subflow you want to move.
5. Select the update set containing the parent workflow in the Update set field.
   - If this field is not on the Customer Update form, configure the form and add the field.
6. Click Update.
   - The base system moves the dependent subflow to the update set selected.
7. Repeat steps 4-6 to add additional dependent subflows to the parent flow update set.

**ValidateInputVarUpdateSetDependencies**
The ValidateInputVarUpdateSetDependencies validator examines update sets to ensure that workflow input variables for a given workflow have not been deleted in different update sets than those currently in progress.
Validation summary

• Risk: Workflows and their input variables are not moved together in a single update set. The deletion of input variables is captured in a different update entry. If these two entries are not in the same update set, the workflow execution can be unstable.
• Purpose: Determine whether input variables that belonged to this workflow were deleted in a different update set.
• Severity Level: Warning
• Valid Result: Valid
• Valid Message: There were no Input Variable Update Set dependency issues found.
• Invalid Result: Invalid
• Invalid Message: There are input variables that have been deleted and logged in a different update set.
• Suggested Action: If the deletion is not intended to be separate from the workflow, ensure that both update sets are committed concurrently to the new instance, or merge both payloads into a single update set.
• Publishable: Yes
• Runnable: Yes
• Related Information: Workflow movement with update sets on page 3337

Troubleshooting

Workflow input variables get individual entries in the Customer Update related list in the current user's update set. This validator reports to the user when workflow input deletions have happened in an update set other than the current user's update set.

Follow the instructions for Input variable removal on page 3340 when the validator issues this warning.

ValidateWorkflowEndStages
The ValidateWorkflowEndStages validator checks that in workflows with stages, the end activity of the workflow has a stage named Complete or Completed.

If the workflow has stages associated with it, but does not have the completed stage on the end activity, then the stage indicator will not show that the workflow completed.

Validation summary

• Risk: The stage indicator will not show the workflow is completed.
• Severity Level: Warning
• Valid Result: Valid
• Valid Message: Workflow end stages are valid.
• Invalid Result: invalid
• Invalid Message: End activity A found with invalid stage "S."
• Suggested Action: If this is not by design, make the appropriate changes.
• Publishable: Yes
• Runnable: Yes
• Related Information: Workflow activities on page 3367
**Troubleshooting**

Check the workflow for an end activity. Ensure that this activity assigns a stage named Complete or Completed.

*ValidateWorkflowStageColumn*

The ValidateWorkflowStageColumn validator detects and reports when the stage field (stage column) for a workflow is not correct or is unusable.

**Validation summary**

- **Risk:** The stage indicators may not display appropriate information.
- **Severity Level:** Warning
- **Valid Result:** Valid
- **Valid Message:** Workflow stage values are valid.
- **Invalid Result:** Warning
- **Info Summary:** Stage warnings found.
- **Invalid Messages:**
  - Table T does not have a column named C.
  - Workflow for table T has stages, but no stage column.
  - Table T has a stage column "C," but no stages are set by activities.
  - Workflow on table T has stage column "C" that is not type=workflow.

- **Suggested Action:** If this is not by design, make the appropriate changes.
- **Publishable:** Yes
- **Runnable:** Yes
- **Related Information:** Workflow activities on page 3367, Workflow stages

**Troubleshooting**

To check the stage column:

1. Open and check out a workflow.
2. Open the workflow version properties dialog by clicking the menu icon and selecting Properties.
3. View the Stages tab or section.
4. Check that the assigned stage column is actually a column in the table to which the workflow is associated.
5. Check that the column is type=workflow.

Tip: Stage columns should not be choice lists. If they are, the list appears read-only in form views, since changing that column value outside the workflow engine does not ensure safe tracking of stage states.

*ValidateWorkflowStateValues*

The ValidateWorkflowStateValues validator checks a number of stage aspects in workflow activities for correctness.

This validator has multiple possible error messages.
Validation summary

- Risk: The stage indicators may not display appropriate information.
- Severity Level: Warning
- Valid Result: Valid
- Valid Message: Workflow stage values are valid.
- Invalid Result: invalid
- Warning summary: Stage warnings found.
- Invalid Messages:
  - Stage with empty name is not allowed.
  - Stage with empty value is not allowed.
  - Cannot have more than one stage with the same name: x.
  - Cannot have more than one stage with the same value: y
- Suggested Action: If this is not by design, make the appropriate changes.
- Publishable: Yes
- Runnable: Yes
- Related Information: Workflow activities on page 3367

Troubleshooting

Use the following procedure to troubleshoot this validator:

1. Open and check out a workflow.
2. Open the list of stages for the workflow by clicking the menu icon and selecting Edit Stages.
3. Check the names and values.
   Ensure that the names and values are unique and are not empty.
4. If the same stage name or value appears more than once, remove one of the rows. It is then very important to go through the workflow and reassign stages in the activities that used the removed stage.
Workflow stages

You can do many things using the Workflow Editor.

- **Modify core activities** and **exit conditions**.
- **Create custom activities** and reuse the data for other workflows.

Tip: Make a list of which activities assign which stages.

**Workflow concepts**

You can do many things using the Workflow Editor.

- **Modify core activities** and **exit conditions**.
- **Create custom activities** and reuse the data for other workflows.

Tip: Make a list of which activities assign which stages.

**Workflow concepts**

You can do many things using the Workflow Editor.

- **Modify core activities** and **exit conditions**.
- **Create custom activities** and reuse the data for other workflows.

Tip: Make a list of which activities assign which stages.
• Download activity packs from the ServiceNow Store and create packs for upload.
• Edit workflows graphically.
• Define transitions between workflow activities.
• For the table that corresponds to the workflow, customize business rules.
• Summarize workflow progress through stages.
• Validate workflows to identify potential problems.
• Publish workflows for other users.
• Edit multiple tables without needing to directly modify them.

Workflow versions

To prevent users from making changes to a workflow that affect other users of the system, workflows must be checked out before they can be edited.

Only one user can check out a workflow at a time. When a workflow is checked out, changes apply only to the user who has the workflow checked out. Other users can continue to use the published workflow. After the changes are complete, the workflow can be published so that it is available to all users.

Note: Because each workflow has a unique sys_id, different workflows can have the same name. This is typically expected in a domain-separated environment where users in different companies cannot see each other’s workflows because they are in different domains. However, this can lead to confusion in other environments. In general, give each workflow a unique name to prevent workflow designers from making changes to the wrong workflow.

When a new version of an existing workflow is published, the changes are not applied to running workflow contexts. Any currently running workflow context continues using the workflow version that was available when the workflow started. The next time the workflow runs, it uses the updated, published version.

Workflow scope

Workflow application scope determines the access that an application has to the information in a workflow, specifically to the data contained in the activities in that workflow.

When a workflow is created, it inherits the application scope from the gear menu for the logged in user. This scope cannot be changed in the Workflow Editor. When the workflow executes, it runs in this scope and can only be called from a different application if the workflow’s accessibility setting permits access to all scopes (public). Otherwise, the workflow’s application scope is private to the application.

Note: Any script that is created in the Workflow Editor, such as an advanced script in an If activity, runs in the scope of the workflow. All core activities provided in the base system or for Orchestration run in the scope of the workflow.

Custom activities run in their own scope, even if it is different from that of the workflow. The scope of a custom activity can be private or public. Any script that runs inside a custom activity with a scope can only access outside artifacts that are within the scope of that activity or artifacts that are configured to run in any scope. Conversely, an outside artifact can only access the script inside that private activity if the outside artifact is running in the same scope. Activities with public scopes can interact with outside artifacts in any application scope.

You can use private activities as part of a workflow that has a public application scope. These activities are protected from reaching outside of the workflow or from being reached from outside the workflow. For details about setting application scoping for custom activities, see the field description table for the appropriate activity template.
Workflow scope restrictions

There are some restrictions to public and private application scopes.

During runtime, publicly scoped workflows can access other application resources, as long as these resources are set to be accessible to all application scopes. Privately scoped workflows in a private application scope can only access resources private to its scope. Due to scope access boundaries, any privately scoped workflows that make calls out to other scoped resources fail with either an exception or a hung activity while waiting for returned results. This occurs when making calls to these common global resources:

- ECC queues
- Tasks
- Approvals
- Events
- SLA timers
- Timers
- Script includes
- Business rules
- Workflow APIs

As you design workflows, validate the visibility and accessibility of all resources prior to deployment. See Application scope.

For information on how to configure the scope for a workflow, see Workflow properties on page 3224.

Domain separation and Workflow

This is an overview of domain separation and the Workflow application. Domain separation enables you to separate data, processes, and administrative tasks into logical groupings called domains. You can then control several aspects of this separation, including which users can see and access data.

Overview

Support: Data only

When domain separation is enabled, workflows and workflow activities inherit the domain of the user who publishes or creates them.

How domain separation works in the Workflow application

While workflows are managed by multiple tables, only the following tables are used for domain separation features:

- Workflow [wf_workflow] and Workflow Version [wf_workflow_version]: used for delegated administration or process separation.
- Workflow Context [wf_context]: used for data separation.
Note: The Workflow Version table \( \text{[wf\_workflow\_version]} \) table does not contain a domain field; Workflow Version records inherit their domain from the parent Workflow record.

The Workflow Editor displays a workflow’s domain in the title bar after the workflow name.

![Workflow editor domain](image)

**Figure 750: Workflow editor domain**

**Workflows and delegated administration**

Delegated administration allows child domains to inherit workflows from higher up the domain hierarchy and to override them with domain-specific versions if necessary.
Workflow records in the Workflow [wf_workflow] and Workflow Version [wf_workflow_version] tables are considered processes. A user in a child domain may check out but not copy a workflow from a parent domain. When a user in a child domain checks out a workflow from a parent domain, the system creates a version of the workflow in that user's domain. This new version is a unique record in the Workflow [wf_workflow] table. After the user publishes this new workflow, other users in the child domain use the
new workflow, which overrides the workflow from the parent domain. The original workflow in the parent domain is no longer visible to users in the child domain.

For example, a managed service provider (MSP) hosts ITSM services for several companies, including ACME and Initech, on a single instance. As administrators, the MSP creates a Change Request - Emergency workflow that applies to all domains because it was created in the TOP domain, which is the highest domain in the domain hierarchy. This workflow overrides the global Change Request - Emergency workflow and specifies that emergency change requests require approval from the CAB approval group. Because of delegated administration, every domain in the hierarchy sees and uses this workflow. Now suppose the ACME domain requires a different approval policy where emergency change requests require approval from the emergency CAB approval group. The MSP creates another version of the Change Request - Emergency workflow in the ACME domain. This workflow overrides the version in the TOP domain and only applies to users in the ACME domain.

Workflow permissions

When a user starts a new workflow, the workflow runs with that user's domain and credentials.

The workflow preserves a user's domain and credentials until an activity causes the workflow to wait, such as an approval activity waiting for approval or rejection. When the stopped workflow resumes, such as when a user approves a request, the workflow uses the credentials of the approving user, but continues to run within the domain of the original user.

Workflows and data separation

Data separation restricts workflow contexts to users who are either in the same domain of the workflow or are members of a parent domain.
Workflow records in the Workflow Contexts [wf_contexts] table are considered data. Data separation restricts workflow contexts to users who are either in the same domain of the workflow or are members of a parent domain. While a user in a parent domain can see running workflows in a child domain, a user
in a child domain cannot see running workflows in a parent domain. If necessary, administrators can use visibility or contains domains to expand who can see domain-specific data.

For example, when an ACME user requests something from the service catalog, a Service Catalog Request workflow context is created in the ACME domain. Similarly, a service catalog request from an Initech user creates a workflow context in the Initech domain. An MSP user in the TOP domain can see both workflow contexts because it is the parent domain for both the ACME and Initech domains. However when an ACME or Initech user logs in, data separation prevents them from seeing each other’s service catalog requests. This is expected behavior because each workflow context contains data specific to that domain, such as the item requested and the request's approval history.

**Workflow engine operation order**

The workflow engine runs in a predefined order relative to business rules and database operations. It caches commonly-used published workflows to improve performance.

The Run after bus. rules run workflow property defines if a workflow is Default or Deferred.

The diagram below shows the workflow engine order of operations and when Default and Deferred flows are executed. For a more general overview of engine operation order, see *Execution order of scripts and engines*. 
**Before** business rules (order <1000)
Do not use current.update() here

Default workflows
Do not use current.update()}

**Before** business rules (order >=1000)
Do not use current.update()}

Database operation (insert, update, delete)
The current record is inserted or updated at the end of the database operation.

**After** business rules (order <1000)
Use current.update() if there is no deferred workflow

Deferred workflows
Do not use current.update()
Workflow caching

The workflow engine caches commonly-used published workflows to improve performance.

Caching significantly reduces the number of database queries per workflow. By default, the engine caches up to 300 unique workflow versions. Caching very large workflows may reduce this number as the cache size cannot exceed the Java Virtual Machine (JVM) heap size.

To change the maximum number of cached workflow versions, navigate to Workflow Administration Properties and modify the value of the The max number of models that will be concurrently held in the LRU cache (glide.workflow.model.cache.max) property. You must restart the instance to apply this change.

Workflow tables

For full flexibility, workflows store information over a number of different tables.

Usually tables containing workflow information are not edited one-by-one. Instead, use the Workflow Editor to edit workflows. The following lists are provided for reference purposes.

Table 1263: Workflow tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workflows</td>
<td></td>
</tr>
<tr>
<td>Column Renderer [column_renderer]</td>
<td>A renderer widget for a stage column. Stage renderers are written in Jelly as a UI Macro. The default is Workflow-Driven; it covers most workflow related stage scenarios.</td>
</tr>
<tr>
<td>Version [wf_versionable]</td>
<td>Tracks different versions of element definitions [wf_element_activity].</td>
</tr>
<tr>
<td>Workflow [wf_workflow]</td>
<td>The master records of workflows.</td>
</tr>
<tr>
<td>Workflow Binding [wf_workflow_binding]</td>
<td>History of workflows run and the triggering record. Workflow Binding records prevent the system from running workflows again when the associated Workflow Context record has been deleted.</td>
</tr>
<tr>
<td>Workflow Context [wf_context]</td>
<td>Individual instances of a workflow being used.</td>
</tr>
<tr>
<td>Workflow Execution [wf_workflow_execution]</td>
<td>Synthetic &quot;current&quot; records for workflows that run on Global.</td>
</tr>
<tr>
<td>Workflow Instance [wf_workflow_instance]</td>
<td>Connections of workflows to subflows.</td>
</tr>
<tr>
<td>Workflow Version [wf_workflow_version]</td>
<td>Particular versions of a workflow, either published versions or versions that have been checked out.</td>
</tr>
<tr>
<td>Activities</td>
<td></td>
</tr>
<tr>
<td>Activity Variables [wf_activity_variable]</td>
<td>Variables for activities.</td>
</tr>
<tr>
<td>Workflow Activity [wf_activity]</td>
<td>Activities as they are being used in workflows.</td>
</tr>
<tr>
<td>Workflow Activity Definition [wf_activity_definition]</td>
<td>Definitions of activities that can be used in a workflow.</td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Workflow Executing Activity [wf_executing]</td>
<td>Individual instances of activities being performed in active contexts.</td>
</tr>
<tr>
<td>Workflow components</td>
<td></td>
</tr>
<tr>
<td>Element Provider [wf_element_provider]</td>
<td>Template definitions for custom activities.</td>
</tr>
<tr>
<td>Variable [item_option_new]</td>
<td></td>
</tr>
<tr>
<td>Workflow Condition [wf_condition]</td>
<td>All of the defined conditions in workflows.</td>
</tr>
<tr>
<td>Workflow Queued Command [wf_command]</td>
<td>Temporary internal storage for workflows that are currently executing.</td>
</tr>
<tr>
<td>Workflow SC Variable [wf_variable]</td>
<td>The Service Catalog variables for a workflow.</td>
</tr>
<tr>
<td>Workflow Schedule [wf_workflow_schedule]</td>
<td>Definitions of the times to run specific workflows.</td>
</tr>
<tr>
<td>Workflow Transition [wf_transition]</td>
<td>All of the defined transitions in workflows.</td>
</tr>
<tr>
<td>History</td>
<td></td>
</tr>
<tr>
<td>Workflow Activity History [wf_history]</td>
<td>The history of executed activities.</td>
</tr>
<tr>
<td>Workflow Log Entry [wf_log]</td>
<td>All of the events and history of the workflow.</td>
</tr>
<tr>
<td>Workflow Transition History [wf_transition_history]</td>
<td>The history of executed transitions.</td>
</tr>
<tr>
<td>Stages</td>
<td></td>
</tr>
<tr>
<td>Stage Default [wf_stage_default]</td>
<td>Definitions of default stage fields for tables to use.</td>
</tr>
<tr>
<td>Stage Set [stage_set]</td>
<td>A named set of stages that can be used to populate workflow stages for multiple workflows.</td>
</tr>
<tr>
<td>Stage Set Entry [stage_set_entry]</td>
<td>The stages that belong to a named stage set.</td>
</tr>
<tr>
<td>Stage Set for Table [stage_set_table]</td>
<td>Defines a relationship of a stage set to a table so that the stage set can be used as the default stages when a new workflow is created for the table. This replaces the wf_default_stage table and is the view that shows when you click Default Stages (by table) in the menu.</td>
</tr>
<tr>
<td>Workflow Stage [wf_stage]</td>
<td>Definitions of stages used by workflows.</td>
</tr>
</tbody>
</table>

Workflow administration

Tailor workflows exactly the way you want them.
Workflow roles

Certain roles are required to use workflows.

Table 1264: Workflow roles

<table>
<thead>
<tr>
<th>Role title [name]</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity creator [activity_creator]</td>
<td>Creates and edits custom workflow activities, reuses custom activity data, and manages activity packs downloaded from the ServiceNow Store.</td>
</tr>
<tr>
<td>Web service administrator [web_service_admin]</td>
<td>Accesses and uses REST and SOAP messages in the Orchestration activity designer on page 1990. Creates and edits custom activities that use the REST web service and SOAP web service templates.</td>
</tr>
<tr>
<td>Workflow administrator [workflow_admin]</td>
<td>Creates, edits, publishes, and deletes graphical workflows.</td>
</tr>
<tr>
<td>Workflow creator [workflow_creator]</td>
<td>Creates new graphical workflows.</td>
</tr>
<tr>
<td>Workflow publisher [workflow_publisher]</td>
<td>Publishes graphical workflows.</td>
</tr>
</tbody>
</table>

Administering workflow contexts

The workflow context performs the activities and transitions defined in the workflow with the new record as current.

Workflow in ServiceNow names a running workflow a Workflow Context. The Workflow Context maintains the state of the overall process in the Workflow Context record. The Workflow Context maintains the state of the individual activities as they execute in a series of related lists. These lists maintain the state of currently executing activities, the result of finished activities, and the execution path the workflow took through the process model.

The Workflow Context canvas provides a visual representation of the execution path the workflow took through the process model. The state of each activity (finished, executing, cancelled, error) is represented using the color palette. The executed paths are represented in the color blue; the non-executed paths are represented in grey. Active and historic workflow contexts, as well as the activities within them, can be viewed using the Live Workflows section of the Workflow application menu.

Viewing a workflow context

Workflow contexts can be found in two places:

- From the Workflow Context related link on the form of the task being powered by the workflow.
- By navigating to Workflow All Contexts and selecting an active context.
Displaying workflow progress

Two related links on the Workflow Context form allow you to view the progress of a workflow in different formats.

- Show Timeline displays the workflow context as a timeline.
- Show Workflow displays the workflow context in the graphical Workflow Editor.

Graphical interface

To view the workflow context in the graphical Workflow Editor interface, click the Show Workflow link from either the workflow context record or the current record.
Figure 754: Show workflow

In the top right hand corner are two controls:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Refresh button" /></td>
<td>Refreshes the workflow context.</td>
</tr>
<tr>
<td><img src="image" alt="Color key icon" /></td>
<td>Displays a key of the colors used in the workflow to denote the state of activities and transitions:</td>
</tr>
</tbody>
</table>
Execution order

View tooltip text in the workflow context graphical view to see the execution order of individual activities.

In Workflow Live Workflows Active Contexts or All Contexts, Open the context you want to examine. Click Show Workflow, and point to a finished or executing activity. The tooltip shows error data, execution time, and the order in which the activity executed in the workflow. Use this data to help troubleshoot activities in an error state.
Cancel a workflow

Canceling a workflow stops the workflow from executing and sets the workflow context State to Canceled. To cancel an executing workflow, you can use the cancelContext(context) script. You can define an on Cancel script to clean up unresolved workflow activities.

Canceling a workflow attempts to stop the workflow gracefully by injecting a cancel command into the workflow engine.

To cancel an active workflow:

1. Navigate to Workflow Active Contexts.
2. Select a workflow context record.
3. Select the Cancel related link. A confirmation window appears.

4. Click OK. The Wait for Cancel window appears. The workflow engine attempts to cancel the workflow gracefully.

If the workflow does not respond to the cancel command, the Force Cancel window appears.
5. Click Force cancel to interrupt the thread the workflow is actively executing or click Continue waiting to continue waiting for the workflow to cancel gracefully.

**Warning:** Whenever possible, allow a workflow to cancel gracefully. Forcing a workflow to cancel can leave related workflows and scripts in an unresolved state. You can use an on-cancel script to clean up unresolved artifacts from a cancelled workflow.

---

**Cancel a workflow with the cancelContext(context) script**

To cancel an executing workflow, you can use the cancelContext(context) script. This script can be useful in cases where a workflow must be canceled in response to an event or where a user must manually cancel a workflow.

For more information, see the [API reference](#).

**Define an on-cancel script**

Canceling a workflow can leave records or scripts in an unresolved state. For example, canceling a service catalog workflow may leave catalog items in the requesting user's cart. An administrator can specify an On-cancel script that runs when the workflow transitions to the Canceled state. This script can notify users, log information, or resolve the state of any scripts run within a workflow activity. The sys_id of the workflow context is available in this script using the context_sys_id variable.

To define this script:

1. Navigate to Workflow Workflow Versions.
2. Select a workflow version that you have checked out. Workflow versions that are not checked out are not editable.
3. Edit the On-cancel script field.
   You may need to configure the form to add this field.
4. Click Update.

   This example script adds a comment to a Requested Item [sc_req_item] record indicating the workflow for that request has been canceled.

   ```javascript
   var grContext = new GlideRecord("wf_context");
   grContext.get(context_sys_id);
   var grReq = new GlideRecord("sc_req_item");
   ```
// The current record may not exist, make sure it exists before modifying it.
if (grReq.get(grContext.id)) {
    grReq.comments = "The workflow processing this item was Canceled. Contact your system administrator for further information."
    grReq.update();
}

Scheduling a workflow

In addition to being run based on conditions, workflows can also be scheduled to perform at a particular time, similar to a scheduled job.

Scheduled workflows do not have a defined current record and do not run on specific records within a table. Due to this behavior, certain activities that depend on a current record, such as Create Task or Catalog Task are unavailable on scheduled workflows. If your workflow requires one of these activities, consider using a scheduled job that inserts a record to start the workflow instead of using a scheduled workflow.

To schedule a workflow, navigate to Workflow Scheduled Workflows and click New. Populate the following fields:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>A unique name for the scheduled workflow.</td>
</tr>
<tr>
<td>Workflow</td>
<td>Select an existing published workflow to be triggered at the specified date, time, or interval.</td>
</tr>
<tr>
<td>Active</td>
<td>If selected, the scheduled workflow will be triggered at the appropriate time.</td>
</tr>
<tr>
<td>Application</td>
<td>Specifies the type of application, such as Global.</td>
</tr>
<tr>
<td>Run</td>
<td>A choice list to determine when the workflow should be triggered. Options are:</td>
</tr>
<tr>
<td></td>
<td>• Daily: At a particular hour every day.</td>
</tr>
<tr>
<td></td>
<td>• Weekly: On a particular day of the week.</td>
</tr>
<tr>
<td></td>
<td>• Monthly: On a particular day of the month</td>
</tr>
<tr>
<td></td>
<td>• Periodically: After every set duration.</td>
</tr>
<tr>
<td></td>
<td>• Once: At one specific date and time.</td>
</tr>
<tr>
<td>Time</td>
<td>For daily/weekly/monthly scheduled workflows, the time of day to run the workflow.</td>
</tr>
<tr>
<td>Day</td>
<td>For weekly scheduled workflow, the day of the week to run the workflow. For monthly scheduled workflows, the day of the month to run the workflow.</td>
</tr>
<tr>
<td>Repeat Interval</td>
<td>For periodical workflows, the interval between workflows, beginning from the Starting date and time.</td>
</tr>
</tbody>
</table>
Workflow movement with update sets

The system tracks workflows in update sets differently than other records because workflow information is stored across multiple tables.

Changes made to a workflow version are not added to the update set until the workflow is published, at which point the entire workflow is added into the update set. Update sets store workflows as a single Workflow [wf_workflow] record and only retain the latest version with the update type of Workflow.

For information about update sets, see System update sets.

Workflow update set migration use case - simple

Create a new workflow with no dependencies and then migrate the workflow in an update set.

1. User A selects Update Set A.
2. User A creates a new workflow called Workflow A.
3. User A publishes Workflow A.
   A customer update set record is added to Update Set A containing an XML payload, including the published Workflow A and all activity dependencies. The XML payload also contains the workflow input variables associated with the workflow.
4. User A completes Update Set A and migrates it to the production instance.
5. Update Set A commits successfully.
6. Workflow A works as expected.

Workflow update set migration use case - subflow dependency (success)

Successfully edit and migrate an existing workflow and its dependent subflow.

1. User A selects Update Set B.
2. User A checks out Workflow A.
3. User A adds a subflow called Workflow B to Workflow A.
   Assume that Workflow B was previously published and migrated to the production instance.
4. User A publishes Workflow A.
   A customer update set record is added to Update Set B containing an XML payload, including the published Workflow A and all activity dependencies. The XML payload also contains the workflow input variables associated with the workflow.
5. User A completes Update Set B and migrates it to the production instance.
6. Update Set B commits successfully.
7. Workflow A works as expected with Workflow B as a subflow.
Workflow update set migration use case - subflow dependency (failure)

Edit and migrate an existing workflow from a test instance to a production instance that fails to run on the production instance because of a missing dependent subflow.

1. User A selects Update Set C.
2. User A checks out Workflow A.
3. User A adds a subflow called Workflow B to Workflow A.
   
   Assume that Workflow B was previously published, but has not been migrated to the production instance.
4. User A publishes Workflow A.

   A customer update set record is added to Update Set C containing an XML payload, including the published Workflow A and all activity dependencies. The XML payload also contains the workflow input variables associated with the workflow.

   Notably absent from Update Set C is the subflow called Workflow B. Workflow B was published before User A selected Update Set C.
5. User A completes Update Set C and migrates it to the production instance.
6. Update Set C commits with warnings.
7. Workflow A is invoked on the production instance with the following results:

   Workflow A fails the runtime validation check and is prevented from running on the production system. The system adds to the workflow context a workflow log entry detailing the cause of the failure, notably the absence of a dependent workflow.

   To learn more about the validation checks on workflow dependencies and update sets see ValidateUpdateSetDependencies on page 3310.

Workflow update set migration use case - subflow dependency (risk)

Multiple users migrate a workflow from a test instance to a production instance without proper coordination. This use case can succeed, but only when each user understands the dependencies and properly migrates the dependent parts of the workflow to the new instance.

This example does not represent an update set failure, although update sets are most often blamed in this use case. Validation increases the visibility of workflow dependencies across multiple update sets and provides designers with better information. In most cases, the warnings do not prevent an action, but only identify risk. The designer is responsible for taking action on advice given in the validation checks.

1. User A selects Update Set C.
2. User A checks out Workflow A.
3. User A adds a subflow called Workflow B that returns a User ID.

   Note: Assume that Workflow B was previously published and migrated to the production instance.
4. User A uses the return value of Workflow B to generate approvals.
5. User B selects Update Set D.
6. User B checks out Workflow B (the subflow in Workflow A).
7. User B modifies the return value of the workflow by changing it from a User ID to a String Message.
8. User A publishes Workflow A.
9. User A cancels publishing and validates Workflow A.

10. User A is warned that Workflow B was modified by a user in a different update set.

11. User A ignores this warning and publishes Workflow A.

Note: A customer update set record is added to Update Set C containing an XML payload, including the published Workflow A and all activity dependencies. The XML payload also contains the workflow input variables associated with the workflow.

12. User A completes Update Set C and migrates it to the production instance.

13. Workflow A is invoked on the production instance and runs successfully using the older version of Workflow B already on the system.

14. User B publishes Workflow B.

Note: User B is not warned of the Update Set C dependency, because the update set is no longer In progress. However, User B is informed via a dialog box that there are warnings associated with the workflow version and is instructed to validate Workflow B. If User B cancels publication and validates the workflow, User B is warned that there are workflows that use Workflow B as a subflow. Knowing the return value was changed, User B should test those workflows as well. See ValidateUpdateSetDependencies on page 3310 to understand the parameters of update set warnings.

15. User B finally publishes Workflow B.

Note: A customer update set record is added to Update Set D containing an XML payload, including the published Workflow B and all activity dependencies.

16. User B completes Update Set D and migrates it to the production instance.

17. Update Set D commits without warnings.

18. Workflow A is invoked on the production instance and fails to run successfully, because the return value of Workflow B no longer generates a User ID.

Input variable movement

You can add input variables to existing workflows and add them to update sets.

When you submit the new variables, an entry is made into the current update set that reflects the addition of a variable to the Variables [var_dictionary] table. Unlike the workflow version that only writes to the update set when the workflow is published, the variables write individual update entries into the currently selected update set immediately upon submission.

Input variable movement use case - two input variables

An existing workflow already contains two input variables.

1. User A checks out the workflow.

2. User A adds two input variables.

   ServiceNow adds to the current update set one customer update record for each new variable.
The current workflow now has 4 input variables: the two that were present prior to check out and the two new ones.

3. User A publishes the workflow.

There are now three related customer update records: two for new variables, and one for the published workflow. The XML payload of the new workflow version now includes all input variable database entries. So while the two original input variables do not have individual customer update records, all four variables are migrated to the local instance with the payload of the newly published workflow version.

4. Verify variables included in a specific workflow.

5. User A completes the update set.

6. Adding Input Variables - Success

User A migrates and commits the update set to a local instance where the original workflow version had previously been committed.

- The two existing input variables are already present because of the earlier version.
- The system adds the two new input variables when the user commits the update set.
- The system preserves the two legacy input variables on the instance receiving the update set. The update set does not overwrite these variables.
- The new published workflow version uses all four variables.
- The user tests the new workflow version and it runs as expected.

Verify variables included in a specific workflow
You can verify the variables that are included in a specific workflow.

1. Navigate to System Update Sets Local Update Sets.
2. Select the active update set.
3. Select the customer update entry for the workflow.
4. View the XML Payload.
5. Search for the name of one of the columns or search for var_dictionary.

There is one var_dictionary entry for each input variable.

Input variable removal

Deleting workflow input variables, like insert and update actions, creates a customer update record in a user’s current update set.

These deletions migrate to a new instance with the update set, regardless of whether the workflow that owns the input variables is published in the same update set. Plan carefully and use caution when editing a workflow and selecting update sets.

Input variable removal risk
An existing workflow already contains two input variables.

1. The workflow was migrated to a production instance with the two variables.
2. On a development instance, User A selects Update Set A and checks out the workflow.
3. User A removes one input variable and all references to it in the workflow.

   The system enters into Update Set A one customer update record reflecting the deletion of the input variable. No record is added for the new workflow version which no longer depends on the input. This does not happen until the workflow is published.

4. User A continues working on other features in Update Set A that need to be moved to production.
5. User A completes Update Set A and migrates it to the production instance without publishing the workflow.

The update set entry that deletes the workflow input variable now applies to the production instance. The prior version of the workflow is running on this instance and still references the missing variable.

**Input variable removal solution**

When editing workflows, particularly when deleting input variables, be sure to use a single update set for all variable editing and workflow publishing.

If necessary, merge the update set into a more general set targeted for deployment after the workflow is published. For information about update sets, see [System update sets](#).

---

**Note:** If a workflow version is already running on a production system and input variables are deleted from a newer version, those deletions could affect transactions already running against the earlier version. Use extreme caution when deleting workflow input variables and plan the migration carefully.

---

**Input variable removal prevention**

Prior to publishing a workflow version, the system validates the workflow model to assist the designer in planning for deployment.

This validation warns of critical errors that can prevent a workflow from running successfully, but also warns of dependencies and conflicts in update sets. See [ValidateUpdateSetDependencies](#) on page 3310 for more details.

---

**Avoiding duplicate workflows**

Update sets manage the published state of all versions of a workflow prior to committing the workflow version on a local instance.

The last version of a workflow committed as an Insert or Update using an update set becomes the currently published version, regardless of the publishing sequence for the workflow versions.

**Commit a workflow in an update set**

Follow the steps in this page to commit a workflow in an update set.

1. Workflow A - Version 1 is created and published in Update Set A.
2. Update Set A is completed and migrated to a local instance.
3. When the update set is committed, the system sets all prior versions of Workflow A to published = false.

   In the first migration, there are no prior versions.
4. Workflow A - Version 1 becomes the only published version of the workflow.

**Update set migration example**

It is not possible to have multiple published versions as a result of update set commits. However, this does not eliminate risk, and care should be taken when migrating update sets.

Consider this example:

1. Workflow A - Version 1 is migrated and committed to the production instance.
2. Update Set B is created.
3. Update Set C is created.
4. Workflow A - Version 2 is published in Update Set B.

   A customer update record is added to Update Set B with the Version 2 payload.

   A customer update record is added to Update Set B with the Version 1 workflow left unpublished.
5. Update Set B is completed.
6. Workflow A - Version 3 is published in Update Set C.
   A customer update record is added to Update Set C with the Version 3 payload.
   A customer update record is added to Update Set C with the Version 2 workflow left unpublished.
7. Update Set C is completed.
8. Update Set C is migrated and committed to the production instance.
   Workflow A - Version 1 is set to unpublished.
   Workflow A - Version 2 update is skipped since Update Set B, which contains Version 2, was never migrated.
   Workflow A - Version 3 is committed and becomes the only published version of the workflow.

**Update set migration risk**
Update Set B is migrated and committed to the production instance.

1. Workflow A - Version 3 is set to unpublished.
3. Workflow A - Version 2 is committed and becomes the only published version of the workflow.
   The workflow has gone back a version, perhaps unintentionally. The regressed version becomes the currently published version.

**Workflow timelines**

The system provides a timeline view of history activities associated with a workflow context.

Timelines display a linear calendar of activities, such as tasks and approvals, defined by their start and end dates. Each activity on the timeline is represented by a span, which is displayed as a horizontal, colored bar. Each span has a label and a tooltip that contains additional information about the activity. The left pane displays all the activities in the context (or contexts) in an expandable hierarchy. You can change the timeline's perspective for a more granular view of the data.

**Note:** Workflow timelines reflect context history only and are not real-time gauges of workflow activity.

**Use a timeline**

By default, the timeline displays all activities and transitions requested when first opened.

Collapse any part of the hierarchy in the activity pane and the timeline adjusts automatically. Date/time and duration controls enable you to scale the timeline to view all the elements at once. To display a timeline, click a UI action within a Workflow Context record.

1. Navigate to Workflow Live Workflows Active Contexts.
2. Select a context.
3. In Related Links, click Show Timeline to display the timeline for the entire context.
   The timeline opens with all activities expanded and the view set to Max, which displays the entire timeline at the width of the pane. The title of the timeline is in the form Workflow context: <context name>, Requested Item: <requested item number>.
4. Use the Range Selectors at the top of the timeline to change the perspective.

The increments go from one day to one year. To limit the timeline to an increment between the start date of the first span and the end date of the last span, click Max.

5. Use the starting and ending calendar fields to select the timeline perspective.

These fields control the same perspective as the slider at the bottom of the timeline.

6. Use the pink slider at the bottom of the timeline to change the perspective.
1. Move the slider from right to left to view all the spans on a long timeline.

2. Adjust the end points of the slider to make arbitrary changes to the magnification.

   A narrow slider zooms in on the spans and provides a more detailed view of complex timelines. A wide slider pulls the view out and makes more of the timeline visible on the screen.

7. To focus the timeline view on selected activities, expand or collapse the activity tree.

   Spans not visible in the activity tree are not shown in the timeline pane.

8. Hover over an activity span to display a tooltip with information about the activity.

   This action highlights the activity in the activity pane.
9. Hover over the transition between two activities to highlight the activity and the predecessor activity in the activity pane.

10. Double-click a span to display a history record for that activity.

History records shows information such as the State and the starting and ending times.
Timeline for a selected activity

You can display a partial workflow timeline.

1. Navigate to Workflow Live Workflows Active Contexts.
2. Open a Workflow Context record.
3. On the Workflow Activity History related list, select one or more individual activities.
4. Click Show Timeline from the action menu.
   The resulting view is a snapshot of the timeline, showing only the selected activities and their transitions, if any.
5. Collapse the tree to confine the view even further.
6. To view a timeline displaying activities from different contexts:
   You might use this feature to display a subflow’s context with the parent workflow context.
   1. Navigate to Workflow Live Workflows History.
   2. Select individual history items from the list.
   3. Select the Show Timeline option from the actions menu.
      
      History items are arranged in a hierarchy in the activities pane under their contexts. The timeline title is Multiple Contexts. The timeline draws only the activities and relationships of the history items selected.

View subflows in a workflow timeline

In a workflow timeline, subflow spans appear as a different color than the activities of the main workflow.
Workflow error handling

The personalized JavaScript that users create in workflow activity variables is vulnerable to run-time syntax errors. Available error information is available in a tooltip when you point to a workflow activity in an error state.

In the base system, workflow activities do not provide condition routing on the error state. As a result, the workflow progresses based on the state of the current record. For example, a workflow contains an Approval - User activity that uses an advanced script to add additional approvers. A syntax error in the script results in no approvers being added. Because a state of no approvers is a valid return, even without the syntax error, the approval activity is skipped and the workflow progresses along a positive path. However, this might not be a valid response for the workflow designer who does not want the workflow to progress along the positive path without approvers.

Workflow error handling detects and logs syntax errors and provides a state that the workflow designer can use to add error conditions to the workflow. Use error handling to locate syntax errors in advanced script fields for these workflow activities:

- Approval - User
- Approval - Group
- Catalog Task
- Create Task
- If
- Run Script
Available error information

This table shows which activities support error exits.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Workflow log</th>
<th>Red error indicator</th>
<th>Activity state</th>
<th>Activity result</th>
<th>Fault description</th>
<th>Reroute on error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approval - User</td>
<td>Yes</td>
<td>Yes</td>
<td>Error</td>
<td>Skipped</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Approval - Group</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Catalog Task</td>
<td>Yes</td>
<td>No</td>
<td>Finished</td>
<td>none</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Create Task</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If</td>
<td>Yes</td>
<td>Yes</td>
<td>Error</td>
<td>none</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Run Script</td>
<td>No</td>
<td>Yes</td>
<td>Error</td>
<td>error</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Notification</td>
<td>Yes</td>
<td>Yes</td>
<td>Error</td>
<td>error</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Workflow error tracking features

Error handling provides visual cues within the workflow, such as error descriptions for activities in pop-ups, and detailed log records.

Banners

Look for an activity with a red banner, indicating that a syntax error has occurred in a script field. All activities that provide error handling, with the exception of Catalog Task and Create Task, display a red banner for this error.

Tooltips

Point to the activity displaying a red banner to view information about the error. A tooltip shows the State and Result of the activity and provides a brief Fault Description (except for task activities). Note that this approval continued as skipped despite the error given in the fault description. See Workflow error handling on page 3348 for the information available to each activity.
**Execution order**

Tooltip text in the Workflow Context graphical view displays the execution order of individual activities, which assists in troubleshooting.

To view the order in which a workflow activity was executed:

1. Navigate to Workflow Live Workflows Active Contexts or All Contexts.
2. Open the context you want to examine.
3. Click Show Workflow.
4. Hover the cursor over a finished or executing activity.

   A tooltip appears showing error data, execution time, and the order in which that activity executed in the workflow. You can use this data to help troubleshoot activities in an error state.
Workflow log

View the log in the Workflow Context form for more information about the syntax error in the activity. Since task activities do not display a red banner when a syntax error has occurred, you must view the log if you suspect the workflow has not run properly. Examine the error description in the log, and then inspect the script in the activity named in the log.

To view the activity by name, navigate to Workflow Administration Properties and enable the Log workflow debug messages property.

Figure 757: Activity execution order
In this example, an SSH activity named File Read specifies an invalid MID Server.

<table>
<thead>
<tr>
<th>Activity name</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCOPE Debug</td>
<td>EXIT SCOPE: Moving from scope ssh_pack to rhino.global</td>
</tr>
<tr>
<td>ENGINE Debug</td>
<td>running File Read(c7d607d44822205f2a8111c73: event=execute)</td>
</tr>
<tr>
<td>ACTIVITY Error</td>
<td>The MID Server (arcdemo_mid) is not valid</td>
</tr>
<tr>
<td>ACTIVITY Error</td>
<td>File Read(674077a46822205f2a8111c73: event=execute): MID Server arcdemo_mid is not valid</td>
</tr>
<tr>
<td>ENGINE Debug</td>
<td>completed File Read(674077a46822205f2a8111c73: event=execute)</td>
</tr>
<tr>
<td>SCOPE Debug</td>
<td>ENTER SCOPE: Moving from scope Global to ssh_pack</td>
</tr>
</tbody>
</table>

**Figure 758: Error handling log**

If the credentials used by an activity in the workflow fail, and the activity cannot authenticate on the target, a message describing the failure appears in the Workflow Log related list. The message displays the target IP address and the credential details.
Create an error condition exit

An administrator can reroute the workflow when a script error occurs by creating an error condition exit for specific activities within the workflow. This allows the workflow to process script errors in a predictable way and not create undesirable results.

1. Open and check out a workflow.
2. Right-click in the top portion of the activity for which you want to create an error exit.
3. Select Add condition from the context menu.
4. Add a condition exit with the following values:
   - Name: Error
   - Condition: activity.state=='faulted'
5. Click Submit.
The Error exit appears on the activity.

6. Connect the Error exit to another activity for handling the error state, such as Notification or Log Message.

Reconfigure an approval condition

Approval activities react differently to script errors than the other activities.
Approval activity script errors can prevent an approval from being processed successfully. This, in turn, can cause the approval to complete as Skipped, which can appear to be an Approved state. To prevent this from happening, reconfigure the Approved exit as follows:

1. Open an approval workflow and make sure it is checked out.
2. On an approval activity, double-click the Approved exit.
3. Add the following script to the Condition field:

```
&& activity.state != 'faulted'
```

This prevents the activity from continuing down the normal path in an error state and ensures that Skipped or Approved is the desired state.
4. Click Update.

Workflow run time metrics

You can enable the collection of workflow run time metrics to determine whether workflows are performing as expected or consuming additional resources.

Outlying run times for a workflow are identified by comparing actual run times to an outlier range calculated with the outlier threshold and estimated run time defined in the workflow properties.

You can monitor the results of these metrics on the Workflow Operations Dashboard and custom homepages with workflow gauges.
Enable workflow run time metrics

Provide an estimated run time that can be compared to actual workflow run times.

For baseline workflows, you must also manually enable the collection of run time metrics. The system automatically enables the collection of run time metrics for new workflows.

To collect run time metrics for a workflow:

1. Navigate to Workflow Workflow Editor.
2. Open and check out the workflow.
3. In the title bar, click the menu icon and select Properties.
4. In the Workflow Properties dialog box, click the Estimated Runtime tab.
5. To enable the collection of run time metrics, check that the Requires ERT option is selected.
6. Open a configuration from the Estimated Run Time column.
7. In Estimated Run Time, enter an initial estimate for the workflow's run time.
   The system compares this initial estimate to actual run time results to create outlier reports. The system can automatically update this field in certain circumstances. Workflow designers can also manually update this field.
8. In the Outlier Percentage Threshold for ERT field, enter the percentage deviation from the estimated run time that identifies an outlier workflow run time.
   The system uses a default value of 20.
9. Click Update.

Outlying workflow run times

Workflow run times are identified as outliers when they are longer or shorter than the outlier range that is computed for the workflow.

The outlier range is automatically computed with the Estimated Run Time and Outlier Percentage Threshold for ERT values in the workflow properties. These values are used in the following formulas.

<table>
<thead>
<tr>
<th>Value computed</th>
<th>Computation used</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outlier Value</td>
<td>Estimated Run Time * (Outlier Percentage Threshold for ERT / 100)</td>
<td>10 seconds * (20 / 100) = 2 seconds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 seconds * 0.2 = 2 seconds</td>
</tr>
<tr>
<td>Outlier Range</td>
<td>(Estimated Run Time - Outlier Value) to (Estimated Run Time + Outlier Value)</td>
<td>(10 seconds - 2 seconds) to (10 seconds + 2 seconds) = 8 to 12 seconds</td>
</tr>
</tbody>
</table>

When a workflow runs within the outlier range, its estimated run time is automatically updated.

If a workflow has an outlying run time, it appears in any outlier workflow gauges on the Workflow Operations Dashboard and custom home pages.

Workflow estimated run time updates

When a workflow runs within the outlier range, its estimated run time is automatically updated.

The estimated run time is updated with the cumulative moving average of the latest run time value in relation to previous run times. The computed value is rounded to the nearest second and stored as a GlideDateTime.
For example:

<table>
<thead>
<tr>
<th>Data point</th>
<th>Latest value</th>
<th>Cumulative running average (CRA)</th>
<th>CRA after rounding to the nearest second</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10 seconds</td>
<td>10 seconds</td>
<td>10 seconds</td>
</tr>
<tr>
<td>2</td>
<td>12 seconds</td>
<td>11 seconds</td>
<td>11 seconds</td>
</tr>
<tr>
<td>3</td>
<td>9 seconds</td>
<td>10.333 seconds</td>
<td>10 seconds</td>
</tr>
</tbody>
</table>

**Note:** Because the system rounds to the nearest second, the calculation is less precise with short durations.

You can also manually update the estimated run time in the workflow properties.

**Workflow pause utility**

Workflow Pause Utility provides functionality you can use to pause or resume all workflow contexts, a subset of qualified workflow contexts, or individual workflow contexts. You designate the data and time of day at which the paused workflows should resume, and can manually resume individual workflows as needed.

Once activated, the Workflow Pause Utility plugin (com.glideapp.workflow.pause) updates several tables when you pause or resume workflows. Each table stores specific data related to each paused or resumed workflow.

- **wf_pause_request**
  Records every workflow pause request. The system automatically updates and inserts records in this table whenever you pause workflow contexts. It tracks user-specified resume time, whether the pause request is still active, and the total number of workflow activities that paused or resumed.

- **wf_pause_status**
  Records the status of each workflow context you pause. When you pause workflow contexts, the plugin waits until the current executing activity finishes, and pauses it before the next activity starts. It tracks the specific activity on which the workflow context was paused and whether it has resumed. If the workflow is paused, it tracks the time at which it is scheduled to resume.

- **wf_pause_group_request**
  Pauses the specific set of workflow contexts you designate using filtering in Group Pause Requests. You can manually pause all currently active workflows by clicking the Pause All check box.

- **wf_pause_snapshot**
  Before pausing and after resuming a workflow, the table records a snapshot of the current state of the workflow context. The table also records the state of the currently executing activity on the paused workflow context.

**Use examples**
When you take down an instance for maintenance, you can pause all or selected active workflow contexts, and then resume them after you complete the maintenance.

You have an integration workflow context that hits an internal service that is down for maintenance. You can pause all instances of that workflow context from progressing to the next activity, allowing time for the internal service to be restored. Then, the paused workflow contexts can be resumed.

Activate workflow pause utility

You can activate the Workflow Pause Utility plugin (com.glideapp.workflow.pause) if you have the admin role. This plugin may include demo data and activates related plugins if they are not already active.

Role required: Workflow_admin or workflow_publisher, workflow_creator

1. Navigate to System Definition Plugins .
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.
   - If the plugin depends on other plugins, these plugins are listed along with their activation status.
   - If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).
4. If available, select the Load demo data check box.
   - Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.
   - You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.
5. Click Activate.

Pause and resume individual workflows

To pause individual workflow contexts, specify the date and time of day at which the workflow context should resume. When a workflow context is paused, the system saves basic information about the pause request, such as the resume date and time, in the wf_pause_request table. A workflow context automatically resumes at a specified date and time of day, but paused workflow context can be manually resumed as needed.

Role required: Workflow_admin or workflow_publisher, workflow_creator

Install and activate the Workflow Pause Utility plugin.

1. Navigate to Workflow Live Workflows Active Contexts .
2. Select the individual workflow context you are pausing.
   - Workflow Context appears.
3. In Related Links, click Pause.
   - A Workflow Pause Inputs dialog appears.
4. In the Workflow Pause Inputs dialog:
a) Click to select the date, and enter the time of day (in hours, minutes, and seconds) at which the workflow should resume. You can select the current date or future date, but you must enter a time of day in the future.

For example, to pause the workflow context at 13:30:00 (1:30 pm), select the date from the calendar, and then enter 13, 30, and 00 into the respective Time: fields.

b) Click when finished.

c) The selected date and time of day appear in the Resume At field.

d) Click OK to return to Workflow Contexts.

The selected workflow is now paused. Use Workflow pause request to monitor its status.

5. Paused workflows resume on the date and time of day specified in the Resume At field. To manually resume a currently paused workflow context:

   a) Navigate to Workflow Live Workflows Active Contexts.
   b) Select the individual workflow context you are pausing.

   Workflow Context appears.

   c) In Related Links, click Resume.

Pause and resume all or multiple workflows

Use Workflow Pause Group Requests to pause, or resume, groups of workflows, or all active workflows. If pausing a group of workflows, use filtering functions to select the workflows. If pausing all active workflows, select the Pause All check box to indicate that all currently active workflows should be paused.

Role required: Workflow_admin or workflow_publisher, workflow_creator

Install and activate the Workflow Pause Utility plugin.

1. Navigate to Workflow Operations Group Pause Requests.

   Workflow Pause Group Requests appears and displays existing workflow pause group requests.

2. Click New.

   Workflow Pause Group Request appears, and assigns a workflow pause group request ID.

3. To pause all active workflows, select Pause All, then click Update. To pause a filtered group of active workflow contexts, skip this step.

   All currently active workflow contexts in the instance are paused until you resume them. Use Workflow pause request to monitor their status.

4. To pause a filtered group of active workflow contexts, use the Filter field, specify the conditions for the search, then click Update.

   Workflow Pause Group Requests appears, and displays the results of the workflow group search. It assigns a workflow pause group request ID and indicates if the group is active (true = paused) or inactive (not yet paused).

5. To update, resume or delete a specific workflow pause group request, select it.

   Workflow Pause Group Request appears, and displays the selected workflow pause group request.
6. If the selected workflow pause group request is active (paused), and you do not want to pause it, click Do Not Pause Incoming Workflows. If the selected workflow pause group request is inactive (not yet paused), click Pause to pause it.

7. For the paused workflow group request, use the Resume At field to specify the date and time of day at which the paused workflow contexts should resume.
   a) Click
      ![Date Selection]
      to select the date, and enter the time of day (in hours, minutes, and seconds) at which the workflow contexts should resume. You can select the current date or future date, but you must enter a time of day in the future.
      For example, to pause the workflow context group at 13:30:00 (1:30 pm), select the date from the calendar, and then enter 13, 30, and 00 into the respective Time: fields.
   b) Click
      ![Date Selection]
      when finished.
   c) The selected date and time of day appear in the Resume At field.
   d) Click OK to return to Workflow Pause Group Request.

8. Click Submit.

9. Paused workflow contexts automatically resume on the date and time of day specified in the Resume At field. To manually resume currently paused workflow contexts:
   a) Navigate to Workflow Pause Group Requests.
   b) Select the workflow pause group request to resume.
      Workflow Pause Group Request appears.
   c) Click Resume, and then click Update.

10. Workflow Group Pause Request also contains the following information fields.

    | Field                          | Description                                                                 |
    |--------------------------------|-----------------------------------------------------------------------------|
    | Active                         | Indicates if workflow group is paused.                                      |
    | Completed Resume Activity Count| Number of resumed workflow context activities that are completed.           |
    | Filter                         | Standard filtering fields used to specify the conditions for selection of a group of workflow contexts. |
    | Log                            | Activity work notes generated by the group pause request.                   |
    | Not Transitioned Workflow Count| Number of workflow contexts that were not transitioned when the group pause request was placed. When a group pause request is placed, the affected workflow contexts are paused before start of the next activity. |
Monitor workflow pause requests

You can monitor the status of workflow pause requests using Workflow Pause Request.

Role required: Workflow_admin or workflow_publisher, workflow_creator

You must install and activate the Workflow Pause Utility plugin.

   Workflow Pause Requests appears and displays existing workflow pause requests.

2. Select the workflow pause request.
   Workflow Pause Request appears, and displays the selected workflow pause request.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Req Number</td>
<td>Unique assigned pause request number.</td>
</tr>
<tr>
<td>Completed Resume Activity Count</td>
<td>Number of workflow context activities resumed after the pause completed.</td>
</tr>
<tr>
<td>Pause Active</td>
<td>Selected indicates the workflow context is currently paused. Cleared indicates it is not.</td>
</tr>
<tr>
<td>Transitioned During Pause</td>
<td>Number of workflow contexts that transitioned when the pause request was placed. When a pause request is placed, the affected workflow contexts are paused before start of the next activity.</td>
</tr>
<tr>
<td>Workflow Context</td>
<td>Reference number for the paused workflow context.</td>
</tr>
<tr>
<td>Log</td>
<td>Activity work notes generated by the group pause request.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Paused Act Count</td>
<td>Date and time of day (h:m:s) at which the paused workflow context is resuming.</td>
</tr>
<tr>
<td>Requester Name</td>
<td>Name of the person who requested the workflow pause.</td>
</tr>
<tr>
<td>Resume Act Count</td>
<td>Number of workflow context activities resumed after the pause completed.</td>
</tr>
<tr>
<td>Resume At</td>
<td>Date and time of day (h:ms:s) at which the workflow contents are scheduled to resume.</td>
</tr>
<tr>
<td>Table</td>
<td>Related record table name.</td>
</tr>
<tr>
<td>Application</td>
<td>Application in which the workflow context is executing.</td>
</tr>
<tr>
<td>Exec Act Count</td>
<td>Number of activities executing when the workflow context was paused.</td>
</tr>
<tr>
<td>Group Pause Request</td>
<td>Reference number for the associated group pause request, if any. Appears only if pause request was the result of a group pause request.</td>
</tr>
<tr>
<td>Is Workflow Complete</td>
<td>Selected indicates the workflow context is complete. Cleared indicates it is not.</td>
</tr>
<tr>
<td>Is Workflow Stuck</td>
<td>Selected indicates the workflow context is stuck. Cleared indicates it is not.</td>
</tr>
<tr>
<td>State</td>
<td>Current state of the workflow context - Paused or Resumed.</td>
</tr>
<tr>
<td>Stuck Activities Count</td>
<td>The number of workflow context activities that are stuck.</td>
</tr>
<tr>
<td>Stuck Act Count To be subtracted for Pause Percentage</td>
<td>Writer to whom the documentation request is assigned.</td>
</tr>
</tbody>
</table>

**Encrypted workflow scratchpad**

The Encrypted Workflow Scratchpad plugin (com.snc.encrypted.scratchpad) provides encrypted scratchpad support for workflow context and workflow executing activities.

The platform supports encryption on most fields, and workflows can execute on tables with encrypted fields. Encrypted data is typically stored in the workflow scratch pad for workflows that execute using encrypted fields and must access this data after processing an approval, timer, or create task activity.

Data in the workflow scratchpad is not encrypted by default. The Workflow engine supports scratchpad encryption and executing activity records only when the Encrypted Workflow Scratchpad plugin is activated. Once activated, data stored in the wf_context and wf_executing scratchpads is protected by a private workflow engine encryption context, and is prevented from being stored in plain text.

**Activate encrypted workflow scratchpad**

Activate the Encrypted Workflow Scratchpad plugin (com.snc.encrypted.scratchpad) if you have an admin role.
Role required: admin

The Encrypted Workflow Scratchpad plugin must be activated via a customer support request. You should activate and thoroughly test the plugin in a non-production instance. Only after you satisfied with the results should you activate it in a production instance.

When activating it in a production instance, you should pick a low transactional volume time to do so. Prior to its activation, first activate the Workflow Pause Utility (com.glideapp.workflow.pause), and then pause all active workflows. Refer to Workflow pause utility on page 3356. After activating the Encrypted Workflow Scratchpad plugin, resume all paused workflows.

Encrypted Workflow Scratchpad activates these related plugins if they are not already active.

<table>
<thead>
<tr>
<th>Plugin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encryption Support</td>
<td>Allows text fields and attached files to be encrypted.</td>
</tr>
</tbody>
</table>

1. Navigate to System Definition Plugins.
2. Find and click the plugin name.
3. On the System Plugin form, review the plugin details and then click the Activate/Upgrade related link.
   - If the plugin depends on other plugins, these plugins are listed along with their activation status.
   - If the plugin has optional features that depend on other plugins, those plugins are listed under Some files will not be loaded because these plugins are inactive. The optional features are not installed until the listed plugins are installed (before or after the installation of the current plugin).
4. If available, select the Load demo data check box.
   - Some plugins include demo data—Sample records that are designed to illustrate plugin features for common use cases. Loading demo data is a good practice when you first activate the plugin on a development or test instance.
   - You can also load demo data after the plugin is activated by clicking the Load Demo Data Only related link on the System Plugin form.
5. Click Activate.

Once you install and activate the plugin, resume all paused workflows. Refer to Pause and resume all or multiple workflows on page 3358.

Troubleshoot workflows

Troubleshooting tools for workflows enable administrators to isolate execution paths, compare contexts, and track incomplete activities.

The workflow timeline provides a visual representation of the workflow, including transitions and the elapsed time for each activity. A troubleshooting tool for highlighting execution paths helps users perform forensics on a workflow. The highlighting feature can group multiple execution paths in various colors and can isolate rollback processing. Use the workflow highlighter to isolate incomplete tasks and approvals. You can also enable a workflow performance timing feature to troubleshoot slow workflows.
Execution path troubleshooting in timelines

Use the controls in a workflow timeline to isolate specific execution paths or compare multiple execution paths over time.

Timelines show how the activities in the workflow progressed in relation to one another over time. Isolate execution paths and follow transition lines between subflows and the main flow. Processing times provide a view of the workflow that you cannot get from the workflow diagram. Tooltips give precise information about each activity, such as duration.

![Workflow timeline troubleshooting](image)

Figure 760: Workflow timeline troubleshooting

Execution history table

Highlight execution paths and rollbacks to locate activities that may have been left in an unresolved state. Rollbacks, cancels, and deletions during the execution of a workflow can prevent some activities from fully completing. Use highlighting in the execution history table to determine which activities in the workflow were left in an unresolved state.

1. Run the workflow.
2. Navigate to Workflow All Contexts.
3. Select a context to troubleshoot.
4. In the Workflow Context form, select the Workflow Activity History related list.
5. Right-click an activity and select Workflow Debug Toggle Execution Path Highlighting from the context menu.
All activities in that execution path are highlighted in a color selected by the platform. The debug path shows all activities that completed successfully during the workflow.

6. Right-click a rollback activity and select Workflow Debug Toggle Rollback Highlighting from the context menu.

The platform highlights the rollback path (restarted activities) in a different color. Each color represents a group of activities that were part of the same rollback execution. The highlighting includes the activity that initiated the rollback. If you right-click an activity that was not part of a rollback, no rows are highlighted.

Note: The rollback activity itself appears in both execution path and rollback highlighting.
7. To remove highlighting, right-click in the list and select an option to clear execution path or rollback highlighting. You can clear individual rollback paths or all rollback highlighting.

Use the Workflow Operations Dashboard

On the Workflow Operations Dashboard, view and add widgets to help you monitor workflows. Review the performance of workflows and determine which workflows must be improved.

Role required: workflow_admin

The different levels of access are:
- View: View the dashboard and refresh report widgets.
- Customize: Refresh, add, delete, and rearrange widgets.

On the Workflow Operations Dashboard, you can click widget elements to view the records they represent. You can also add new report widgets that are not displayed by default.


The default reports on the dashboard include:
- Workflow contexts providing run time metrics
- Active workflows started during a specified time period
- Workflows run between yesterday and today
• Workflows by state for the current month
• Aged workflow contexts for the past month

2.

To find and add more widgets, click the Add Content icon ( ) in the upper left corner of the dashboard.

If a workflow consistently appears as an outlier and there is no error causing the run time values, you can use its historical run time values to calculate a new estimated run time value. Then update the estimated run time in the workflow properties.

Workflow gauges

Multiple gauges are available to help you review the performance of workflows. You can add these gauges to the Workflow Operations Dashboard or custom homepages.

Table 1270: Workflow gauges

<table>
<thead>
<tr>
<th>Content</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERT Dashboard Controls</td>
<td></td>
</tr>
<tr>
<td>Outlier Finished Workflows for ERT (Percentage Outlier)</td>
<td>Identifies workflows that finished, but did not finish within estimated runtime (ERT) values. Enter an outlier percentage to see workflows that ran outside the specified runtime range.</td>
</tr>
<tr>
<td>Outlier Long Running Workflows for ERT (Percentage Outlier)</td>
<td>Displays workflows running longer than the configured runtime threshold.</td>
</tr>
<tr>
<td>Workflow Dashboard</td>
<td></td>
</tr>
<tr>
<td>Workflows Without Current Record</td>
<td>Displays workflow contexts that do not have an associated current record.</td>
</tr>
<tr>
<td>Gauges  Workflow Context</td>
<td></td>
</tr>
<tr>
<td>Number of Active Workflows Started Hourly Over Time (Yesterday)</td>
<td>Displays the total number of running workflows per hour over a given time period. By default, it displays the number of workflows that ran per hour over the previous day (yesterday).</td>
</tr>
<tr>
<td>Outlier Finished Workflows Not Cumulated to ERT</td>
<td>Displays workflow contexts that are finished outside the estimated runtime outlier value and not cumulated to estimated run time value.</td>
</tr>
<tr>
<td>Running Workflow Context</td>
<td>Displays the total number of running workflows.</td>
</tr>
<tr>
<td>Successfully Finished Workflows Cumulated to ERT</td>
<td>Displays the total number of successfully completed workflows whose running duration is cumulated to the estimated run time value.</td>
</tr>
<tr>
<td>Workflows by State (This Month)</td>
<td>Displays the total number of workflows run in a month grouped by the current state.</td>
</tr>
<tr>
<td>Aged Workflow Contexts (Running Since Last Month)</td>
<td>Displays the total number of workflow contexts running for a given period of time by workflow name. By default, it displays the total number of workflow contexts running over the last month.</td>
</tr>
</tbody>
</table>
Workflow performance timing

The workflow engine can generate detailed performance timing data that is useful for troubleshooting slow workflows.

An administrator must enable this functionality.

When workflow performance timing is enabled, the workflow engine tracks key performance data, including various execution speed metrics. The Workflow Timing [wf_workflow_timing] table stores the data, with a record for each workflow context. The workflow timing record is updated when the workflow engine completes the workflow, waits for an activity to complete, or otherwise exits the workflow execution.

Workflow estimated run time properties

Administrators can enable the collection of workflow run time metrics by setting Estimated Run Time (ERT) properties.

Administrators can use ERT metrics to determine if workflows are running longer or shorter than expected and to identify errors in workflow processing. The system displays run time metrics on the Workflow Operations Dashboard.

Enable workflow performance timing

Workflow performance timing is disabled by default. You can create a system property to enable it.

Role required: admin

  Add a system property with the following specifications.

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>glide.workflow.show_timing</td>
</tr>
<tr>
<td>Type</td>
<td>true</td>
</tr>
<tr>
<td>Value</td>
<td>true</td>
</tr>
</tbody>
</table>

Workflow activities

Workflow activity properties reference

Each activity performs a different task, such as running a script, sending notifications, or requesting approvals. Activities can succeed or fail, which can result in actions performed by other activities.

For information about configuring different types of activities, click an activity name in the list below or see Workflow activities reference on page 3368.

Core activities provided in the base system

- Approval and rollback workflow activities on page 3373
• **Condition Workflow activities** on page 3398
• **Notification workflow activity** on page 3415
• **Notify workflow activities**
• **Subflow activities**
• **Task workflow activities** on page 3423
• **Timer workflow activities** on page 3416
• **Utility workflow activities** on page 3432

### Activities provided with Orchestration

The following activities are included with Orchestration.

- Active Directory activity pack
- Orchestration activities
- PowerShell activities
- Puppet activities

### Templates provided for creating custom activities

If Orchestration is active on your system, users with the proper roles can create custom activities using the ServiceNow *Orchestration activity designer* on page 1990. For information about the templates Orchestration provides for creating custom activities that you can upload to the ServiceNow Store, see *Orchestration custom activity templates* on page 2027.

### Workflow activities reference

Workflow activity reference, organized by category.

Each activity performs a different task, such as running a script, sending notifications, or requesting approvals.

### Approval and rollback activities

Approval and rollback activities generate and manage approvals. Not all workflows can include approval activities. For more information, read *Approval and rollback workflow activities* on page 3373.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Approval Action workflow activity</strong> on page 3373</td>
<td>The Approval Action activity performs an approval action on the current task.</td>
</tr>
<tr>
<td><strong>Approval Coordinator workflow activity</strong> on page 3374</td>
<td>The Approval Coordinator activity creates an approval whose outcome depends on the outcome of one or more child activities, including one or more Approval - User, Approval - Group, and/or Manual Approval activities.</td>
</tr>
<tr>
<td><strong>Approval - Group workflow activity</strong> on page 3377</td>
<td>The Approval - Group activity creates approval records for each member of a specified group.</td>
</tr>
<tr>
<td>Activity</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Approval - User workflow activity on page 3384</td>
<td>The Approval - User activity creates one or more individual user approvals.</td>
</tr>
<tr>
<td>Generate workflow activity on page 3389</td>
<td>The Generate activity immediately creates task or approval records from any task or approval activities placed after the Generate activity in the workflow path. These pre-generated tasks and approvals start when the task and approval activities are reached during flow execution. This allows a task to have a set of associated pre-generated sequential tasks or approvals, but still require them to be completed in order.</td>
</tr>
<tr>
<td>Manual Approvals workflow activity on page 3392</td>
<td>The Manual Approvals activity watches and manages any approvals that users add manually outside of the workflow process. This activity only selects approvals that are in the Not requested state.</td>
</tr>
<tr>
<td>Rollback To workflow activity on page 3394</td>
<td>The Rollback To activity transitions directly to the activity specified by the outgoing transition line arrow.</td>
</tr>
</tbody>
</table>

### Condition activities

Condition activities provide conditional branching and logical operation functionality for workflows.

Table 1272: Condition activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>If workflow activity on page 3398</td>
<td>The If activity checks a condition or script to determine if a Yes or No transition should be taken.</td>
</tr>
<tr>
<td>Switch workflow activity on page 3399</td>
<td>The Switch activity checks if the value of a passed field or variable is equivalent to one of several case values.</td>
</tr>
<tr>
<td>Wait for condition workflow activity on page 3403</td>
<td>The Wait for condition activity causes the workflow to wait at this activity until the current record matches the specified condition.</td>
</tr>
<tr>
<td>Wait for WF Event workflow activity on page 3404</td>
<td>The Wait for WF Event activity causes the workflow to wait at this activity until the specified event is fired.</td>
</tr>
</tbody>
</table>

### Notify activities

Notify workflow activities manage calls and SMS messages in Notify.

Table 1273: Notify activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward call workflow activity on page 892</td>
<td>The Forward Call activity forwards a Notify call to an E.164-compliant phone number.</td>
</tr>
<tr>
<td>Input workflow activity on page 893</td>
<td>The Input activity creates a phone menu by presenting a list of options on a Notify call.</td>
</tr>
<tr>
<td>Activity</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Hangup workflow activity on page 894</td>
<td>The Hangup activity disconnects an active Notify phone call.</td>
</tr>
<tr>
<td>Play workflow activity on page 895</td>
<td>The Play activity plays a sound file on a Notify call.</td>
</tr>
<tr>
<td>Record workflow activity on page 895</td>
<td>The Record workflow activity records audio from a user on a Notify call.</td>
</tr>
<tr>
<td>Reject workflow on page 896</td>
<td>The Reject workflow activity rejects an incoming Notify call.</td>
</tr>
<tr>
<td>Say workflow activity on page 896</td>
<td>The say workflow activity allows you to play a message, using text to speech, on a Notify call.</td>
</tr>
<tr>
<td>Forward to notify client workflow activity on page 897</td>
<td>The forward to notify client workflow activity connects a phone call to a Notify WebRTC client.</td>
</tr>
<tr>
<td>Call workflow activity on page 890</td>
<td>The Call activity makes outbound phone calls using a Notify workflow.</td>
</tr>
<tr>
<td>Join conference call workflow activity on page 888</td>
<td>The Join Conference Call activity connects an incoming or outgoing call to a Notify conference call.</td>
</tr>
<tr>
<td>Send SMS workflow activity on page 891</td>
<td>The send SMS workflow activity to send short text messages using Notify to users' phones.</td>
</tr>
<tr>
<td>Queue workflow activity on page 898</td>
<td>The Queue activity places an active Notify call in a queue.</td>
</tr>
</tbody>
</table>

**Notification activities**

Notification workflow activities notify users of events that occur during the workflow.

**Table 1274: Notification activities**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create Event workflow activity on page 3415</td>
<td>The Create Event activity adds an event to the event queue, but does not immediately fire the event.</td>
</tr>
<tr>
<td>Notification workflow activity on page 3415</td>
<td>The Notification activity sends an email or SMS message to specified users or groups.</td>
</tr>
</tbody>
</table>

**Timer activities**

Timer activities pause workflows for set periods of time.
Table 1275: Timer activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLA Percentage Timer workflow activity on page 3416</td>
<td>The SLA Percentage Timer activity pauses the workflow for a duration equal to a percentage of an SLA.</td>
</tr>
<tr>
<td>Timer workflow activity on page 3417</td>
<td>The Timer activity pauses the workflow for a specified period of time.</td>
</tr>
</tbody>
</table>

Task activities

Task activities create and modify workflow tasks.

Table 1276: Task activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add Worknote workflow activity on page 3423</td>
<td>The Add Worknote activity adds text to the Worknotes field of the current incident record.</td>
</tr>
<tr>
<td>Attachment Note workflow activity on page 3423</td>
<td>The Attachment Note activity adds an attachment to the current record.</td>
</tr>
<tr>
<td>Catalog Task workflow activity on page 3424</td>
<td>The Catalog Task activity creates a service catalog task record.</td>
</tr>
<tr>
<td>Create Task workflow activity on page 3428</td>
<td>The Create Task activity generates a record on any of the tables that extend Task [task].</td>
</tr>
</tbody>
</table>

Utility activities

Utility activities provide controls over the path of the workflow, and other useful tools.

Table 1277: Utility activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Branch workflow activity on page 3432</td>
<td>The Branch activity splits the workflow into multiple transition paths from a single activity.</td>
</tr>
<tr>
<td>Join workflow activity on page 3432</td>
<td>The Join activity unites multiple execution paths into one transition.</td>
</tr>
<tr>
<td>Lock workflow activity on page 3433</td>
<td>The Lock activity prevents other instances of this workflow from continuing past this activity until the lock is released.</td>
</tr>
<tr>
<td>Log Message workflow activity on page 3436</td>
<td>The Log Message activity writes a message to the workflow log.</td>
</tr>
<tr>
<td>Log Trace Message workflow activity on page 3436</td>
<td>The Log Trace Message activity writes a trace message to the workflow log.</td>
</tr>
<tr>
<td>Activity</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><em>REST Message legacy workflow activity</em> on page 3436</td>
<td>The legacy REST Message activity enables an administrator to override the REST endpoint or supply the variables configured in the REST Message module.</td>
</tr>
<tr>
<td><em>Return Value workflow activity</em> on page 3438</td>
<td>The Return Value activity returns a value to a parent workflow, when run from a subflow.</td>
</tr>
<tr>
<td><em>Run Script workflow activity</em> on page 3438</td>
<td>The Run Script activity runs the specified script in the scope of the workflow version.</td>
</tr>
<tr>
<td><em>Set Values workflow activity</em> on page 3438</td>
<td>The Set Values activity sets values on the current record when the workflow quiesces or ends.</td>
</tr>
<tr>
<td><em>SOAP Message legacy workflow activity</em> on page 3439</td>
<td>The legacy SOAP Message activity uses SOAP messages defined in the System Web Services plugin and can call the messages using a MID Server.</td>
</tr>
<tr>
<td><em>Turnstile workflow activity</em> on page 3440</td>
<td>The Turnstile activity limits how many times a workflow can pass through the same point.</td>
</tr>
<tr>
<td><em>Unlock workflow activity</em> on page 3442</td>
<td>The Unlock activity releases a lock that was previously placed by the Lock activity.</td>
</tr>
</tbody>
</table>

### Subflow activities

Subflow activities run and manage workflows from a parent workflow.

**Table 1278: Subflow activities**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Parallel Flow Launcher workflow activity</em> on page 3442</td>
<td>The Parallel Flow Launcher activity launches multiple subflows in parallel.</td>
</tr>
</tbody>
</table>

### Activities provided with Orchestration

The following activities are included with Orchestration.

- Active Directory activity pack
- Orchestration activities
- PowerShell activities
- Puppet activities

### Templates provided for creating custom activities

If Orchestration is active on your system, users with the proper roles can create custom activities using the ServiceNow Orchestration activity designer on page 1990. For information about the templates Orchestration provides for creating custom activities that you can upload to the ServiceNow Store, see Orchestration custom activity templates on page 2027
Approval and rollback workflow activities

Approval and rollback activities generate and manage approvals.

Approval and rollback activities are not available in some workflows.

- With two exceptions, approval and rollback activities are only available when the workflow runs on a table that extends Task. The exceptions are the Approval - User and Approval Action activities, which are available globally.
- Approval and rollback activities are available only if approval engines are turned off for the table on which the workflow runs. If approval engines are enabled for the table, approval activities appear greyed out and cannot be selected. To learn more about how workflow and approval engines interact, read Approval workflow activities and approval engines on page 3464.

Approval Action workflow activity

The Approval Action activity performs an approval action on the current task.

Use this activity to mark the current task record as approved or rejected.

**Note:** When an Approval Action activity is used to mark a task approved, the activity marks all pending approvals as No Longer Required. This activity behaves differently from Set Values or Run Script when used to set the Approval field's value.

Results

The result value of the activity is the final approval disposition selected by the approver. The result value can be Approved or Rejected. A workflow designer can assign a result value using the activity.result variable from within a script field of the activity.

Input variables

Input variables determine the initial behavior of the activity.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action</td>
<td>The action to perform on the task. Options are:</td>
</tr>
<tr>
<td></td>
<td>• Mark task approved</td>
</tr>
<tr>
<td></td>
<td>• Mark task rejected</td>
</tr>
<tr>
<td></td>
<td>• Mark task requested</td>
</tr>
<tr>
<td></td>
<td>• Disregard pending approvals: the system sets approval records to no longer required and marks the activity as approved.</td>
</tr>
</tbody>
</table>

Conditions

The conditions determine which transition runs after this activity.
Table 1280: Approval Action activity conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always</td>
<td>The event or condition that causes the approval to move to the next workflow step.</td>
</tr>
<tr>
<td>Error</td>
<td>The event or condition that generates an error.</td>
</tr>
<tr>
<td>Skipped</td>
<td>The event or condition that allows a skipped approval.</td>
</tr>
</tbody>
</table>

**States**

The activity state tells the workflow engine what to do with the activity.

Table 1281: Approval Action activity states

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executing</td>
<td>The workflow engine starts the execute function of the activity.</td>
</tr>
<tr>
<td>Waiting</td>
<td>The workflow engine ignores the activity until a specific event to restart the activity is fired.</td>
</tr>
<tr>
<td>Finished</td>
<td>The activity finished running. See the result value for the outcome of the activity.</td>
</tr>
<tr>
<td>Cancelled</td>
<td>This activity, or the workflow that contains this activity, was canceled.</td>
</tr>
<tr>
<td>Error</td>
<td>A JavaScript error occurred. Review the logs for error details.</td>
</tr>
</tbody>
</table>

**Approval Coordinator workflow activity**

The Approval Coordinator activity creates an approval whose outcome depends on the outcome of one or more child activities, including one or more Approval - User, Approval - Group, and/or Manual Approval activities.

**Note:** This activity is only available when the workflow runs on a table that extends Task.

To create an Approval Coordinator activity, first drag the activity onto the workflow canvas, causing the activity form to display. On the activity form, fill in the appropriate fields, then click Submit.

After you click Submit, the activity appears on the workflow canvas. From there, specify the child activities by clicking the links that appear on the body of the activity.

When the Approval Coordinator activity completes, all pending approvals that were created by any of the Approval Coordinator approval activities are immediately set to No Longer Required. If a single user is called as an approver twice by the same workflow, such as when a single user is both a product approver and an executive approver, any approvals for that user after the first are skipped.
Results

The result value of the Approval Coordinator activity depends on the approval actions taken by the approvers and the approval conditions specified in the Wait for field. Possible result values are:

- Approved
- Rejected
- Deleted
- Cancelled

Input variables

Input variables determine the initial behavior of the activity.

Table 1282: Approval Coordinator activity input variables

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
</table>
| Wait for | Indicate what to wait for to indicate that the approval activity is approved or rejected. Options are:  
  - Any child activity to be approved: Any child activity (User, Group, or Manual Approval) that completes with a result of approved causes the Approval Coordinator activity to complete with a result of approved.  
  - All child activities to be approved: All child activities of the Approval Coordinator activity must complete with a result of approved to cause the Approval Coordinator activity to complete with a result of approved.  
  - The first approval or rejection from any child activity: The first child activity that completes with a result of approved or rejected causes the Approval Coordinator activity to complete with the same result.  
  - Condition based on script: Call a script to determine how to manage an approval or rejection. |
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>When a rejection occurs</td>
<td>Specify what the coordinator should do when it sees a rejection from any one of the child activities. Options are:                                                                avery complete the Approval Coordinator activity with a result of rejected. Wait for other responses before deciding: Wait until we get other responses from other child activities before making an approval or rejection decision. This allows users to change their minds until a decision is made. In addition, if Wait for is set to Any child activity to approve then a single child activity completion with a result of approved will cause the Approval Coordinator activity to complete with a result of approved even if other child activities have completed with a result of rejected.</td>
</tr>
<tr>
<td>Approval script</td>
<td>If the Wait for variable is set to Condition based on script this script is called to determine how to handle an approval or rejection. The script needs to set the variable answer to approved or rejected to indicate the overall approval status for this approval. When called, the following variable is available to the script: counts.total = total number of child approval activities that are part of this approval counts.approved = # of child approval activities that approved so far counts.rejected = # of child approval activities that rejected so far counts.requested = # of child approval activities that are pending approval</td>
</tr>
<tr>
<td>Conditions</td>
<td>The conditions determine which transition runs after this activity.</td>
</tr>
<tr>
<td><strong>Table 1283: Approval Coordinator activity conditions</strong></td>
<td></td>
</tr>
<tr>
<td>Condition</td>
<td>Description</td>
</tr>
<tr>
<td>Approved</td>
<td>The users from the groups have approved the request based on the Wait for rules.</td>
</tr>
<tr>
<td>Condition</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td>Rejected</td>
<td>The users from the groups have rejected the request based on the Wait for rules.</td>
</tr>
</tbody>
</table>

**States**

The activity state tells the workflow engine what to do with the activity.

**Table 1284: Approval Coordinator activity states**

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executing</td>
<td>The workflow engine starts the execute function of the activity.</td>
</tr>
<tr>
<td>Waiting</td>
<td>The workflow engine ignores the activity until a specific event to restart the activity is fired.</td>
</tr>
<tr>
<td>Finished</td>
<td>The activity finished running. See the result value for the outcome of the activity.</td>
</tr>
<tr>
<td>Cancelled</td>
<td>This activity, or the workflow that contains this activity, was canceled.</td>
</tr>
<tr>
<td>Error</td>
<td>A JavaScript error occurred. Review the logs for error details.</td>
</tr>
</tbody>
</table>

**Approval - Group workflow activity**

The Approval - Group activity creates approval records for each member of a specified group.

**Note:** This activity is only available when the workflow runs on a table that extends Task.

The group approval is approved or rejected based on the user approvals, according to the logic specified in the Wait For field.

**Results**

The workflow designer can assign a result value using activity.result from within a script field of the activity. By default, the result value is the final approval disposition. This disposition depends on the approval actions take by the approvers and the approval conditions specified in the Wait for or When Anyone Rejects fields. Possible result values are:

- Approved
- Rejected
- Deleted
- Cancelled

**Input variables**

Input variables determine the initial behavior of the activity.
### Table 1285: Approval - Group activity input variables

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approval - Group When</td>
<td>Specify when this activity generates a group approval record.</td>
</tr>
<tr>
<td>Condition</td>
<td>Conditions which, if met, cause the group approval to be generated. If the conditions are not met, the approval is skipped.</td>
</tr>
<tr>
<td>Approval - Group Approvers</td>
<td>Specify the groups whose approval will be requested.</td>
</tr>
<tr>
<td>Groups</td>
<td>The groups whose approval will be requested. To edit this field, click the lock icon. To select specific groups by name, use the lookup list. To select groups from field values on the current record at runtime, click the tree icon. Each member of the group will be assigned an individual approval record. If no group is selected, the activity automatically sets the approval to Approved.</td>
</tr>
<tr>
<td>Approval - Group Condition</td>
<td>Specify how the activity decides to approve or reject the group approval, based on the responses from individual members of the group.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Wait for</td>
<td>A choice between different approval logics to determine which individual approvals or rejections result in approval or rejection of the activity's approval. Options are:</td>
</tr>
<tr>
<td></td>
<td>• An approval from each group: Any user from each group can approve and the first approval from each group causes the activity to complete with a result of approved (see below for how a rejection is handled).</td>
</tr>
<tr>
<td></td>
<td>• An approval from any group: Any user from any group can approve and the first approval from any group causes the activity to complete with a result of approved.</td>
</tr>
<tr>
<td></td>
<td>• An approval from everyone from all groups: All users from all groups must approve to cause the activity to complete with a result of approved (see below for how a rejection is handled).</td>
</tr>
<tr>
<td></td>
<td>• First response from each group: The first approval or rejection from any user in each group is used to indicate the state of the group approval (see below for how a rejection is handled).</td>
</tr>
<tr>
<td></td>
<td>Indicate what happens when any user rejects their approval request. Options are:</td>
</tr>
<tr>
<td></td>
<td>• Reject the approval: Immediately complete the activity with a result of rejected.</td>
</tr>
<tr>
<td></td>
<td>• First response from any group: The first approval or rejection from any user in any group causes the activity to complete with a result of approved or rejected.</td>
</tr>
<tr>
<td></td>
<td>• Condition based on script: Each time a user approves or rejects, the Approval script is called to determine if the activity should complete.</td>
</tr>
<tr>
<td><strong>Field</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Approval script</td>
<td>If the Wait for variable is set to Condition based on script this script is called to determine how to handle an approval or rejection. The script needs to set the variable answer to approved or rejected to indicate the overall status for this approval. This script is responsible for setting the approval state for each group that is part of this approval activity before returning the overall approval state for all of the groups. When called, the following variables are available to the script for all the groups that are part of this approval activity:</td>
</tr>
<tr>
<td></td>
<td><code>counts.total</code> = total number of groups that are part of this approval</td>
</tr>
<tr>
<td></td>
<td><code>counts.approved</code> = # of groups that approved so far</td>
</tr>
<tr>
<td></td>
<td><code>counts.rejected</code> = # of groups that rejected so far</td>
</tr>
<tr>
<td></td>
<td><code>counts.requested</code> = # of groups that are pending approval</td>
</tr>
<tr>
<td></td>
<td><code>counts.not_requested</code> = # of groups that are not pending approval</td>
</tr>
<tr>
<td></td>
<td><code>counts.not_required</code> = # of groups that approval is not required</td>
</tr>
<tr>
<td></td>
<td>And for each group:</td>
</tr>
<tr>
<td></td>
<td><code>groups[group_id].total</code> = total number of users that are part of this group's approval</td>
</tr>
<tr>
<td></td>
<td><code>groups[group_id].approved</code> = # of users that approved so far</td>
</tr>
<tr>
<td></td>
<td><code>groups[group_id].rejected</code> = # of users that rejected so far</td>
</tr>
<tr>
<td></td>
<td><code>groups[group_id].requested</code> = # of users that are pending approval</td>
</tr>
<tr>
<td></td>
<td><code>groups[group_id].not_requested</code> = # of users that are not pending approval</td>
</tr>
<tr>
<td></td>
<td><code>groups[group_id].not_required</code> = # of users that approval is not required</td>
</tr>
<tr>
<td></td>
<td><code>groups[group_id].approvalIDs[state]</code> = array of user ids that are at the specified approval state</td>
</tr>
<tr>
<td></td>
<td>Note: Iterate the groups using:</td>
</tr>
<tr>
<td></td>
<td>`for (var id in groups) {</td>
</tr>
<tr>
<td></td>
<td>var group = groups[id];`</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| When anyone rejects | A choice between different approval logics to determine which individual rejections result in rejection of the activity's approval. Options are:  
  • Reject the approval: Immediately complete the activity with a result of rejected.  
  • Wait for other responses before deciding: Wait until we get other responses before making an approval or rejection decision. This allows users to change their mind until a decision is made. |
| Approval - Group Schedule | Specify how workflow calculates the approval record's expected start date and due date. Once you've made a selection for 'Due date based on', and 'Schedule based on', the appropriate fields will display. |
| Due date based on | Select how workflow determines the task's duration, due date, and schedule.  
  • A user specified duration: The duration is based on a user specified value.  
  • A relative duration: The duration is calculated from a relative duration (such as End of Next Business Day).  
  • A date/time or duration field: The duration is based on the value of a field on the current record.  
  • Script: The duration is returned by a script. |
<p>| Duration | The specific number of days and hours. |
| Only appears when Due date based on is set to A user specified duration |  |
| Relative duration | The general number and length of business days. |
| Only appears when Due date based on is set to A relative duration |  |
| Due date field | The date/time or duration field. |
| Only appears when Due date based on is set to A date/time or duration field |  |
| Due date script | The script that sets 'answer' to the number of seconds for the duration. |
| Only appears when Due date based on is set to Script |  |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
</table>
| Schedule based on             | The basic schedule the timer uses to count working hours. If a schedule is specified, the duration will only be considered for times that are specified on the schedule. For example, if the duration is 2 hours and the workflow begins at 4:00pm on a schedule that is 8am - 5pm, then it ends at 9:00am the next day. The options are:  
  • This workflow's schedule: The schedule uses workflow context date, time, and an optional Time zone based on value.  
  • A specific schedule: The schedule uses a pre-defined Schedule and an optional Time zone based on value.  
  • A schedule field: The schedule uses a value from a table and an optional Time zone based on value. |
| Schedule                      | The predefined Schedule from a list.                                                                                                                                                                  |
| Schedule field                | A date and time or duration field for the schedule, that is associated with the table. Valid fields appear in blue on the Select the element from a tree dialog.                                           |
| Time zone based on            | The time zone for calculating the duration. The time zone may be based on:  
  • No time zone: Default. Workflow uses the GMT time zone.  
  • A specific time zone: A specific Time zone that you choose from a choice list.  
  • A time zone field: A Time zone field to track time duration from a field on the form.                                                   |
| Time zone                     | Select the time zone you want from the choice list.                                                                                                                                                 |
| Time zone field               | A date and time or duration field for the schedule, that is associated with the table. Valid fields appear in blue on the Select the element from a tree dialog.                                           |

**Approval - Advanced**

If desired, write a script for determining additional users to request approvals from.
### Field

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced</td>
<td>Select this check box to write a script for determining additional users to request approvals from. Use the Additional groups script to customize group approvals.</td>
</tr>
</tbody>
</table>
| Additional groups script| If the Advanced check box is selected, this script is called to determine any additional group approvals to be created. The script needs to set the variable answer to a comma-separated list of group ids or an array of group ids to add as approver groups. For example:  

```javascript
answer = [];  
answer.push('id1');  
answer.push('id2');
```

---

### Conditions

The following conditions determine which transition runs after this activity.

**Table 1286: Approval - Group activity conditions**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approved</td>
<td>The users from the groups have approved the request based on the Wait for rules.</td>
</tr>
<tr>
<td>Rejected</td>
<td>The users from the groups have rejected the request based on the Wait for rules.</td>
</tr>
<tr>
<td>Error</td>
<td>The event or condition that generates an error.</td>
</tr>
<tr>
<td>Skipped</td>
<td>The event or condition that allows a skipped approval.</td>
</tr>
</tbody>
</table>

---

### States

The activity state tells the workflow engine what to do with the activity.

**Table 1287: Approval - Group activity states**

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executing</td>
<td>The workflow engine starts the execute function of the activity.</td>
</tr>
<tr>
<td>Waiting</td>
<td>The workflow engine ignores the activity until a specific event to restart the activity is fired.</td>
</tr>
<tr>
<td>Finished</td>
<td>The activity finished running. See the result value for the outcome of the activity.</td>
</tr>
<tr>
<td>State</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Cancelled</td>
<td>This activity, or the workflow that contains this activity, was canceled.</td>
</tr>
<tr>
<td>Error</td>
<td>A JavaScript error occurred. Review the logs for error details.</td>
</tr>
</tbody>
</table>

**Approval - User workflow activity**
The Approval - User activity creates one or more individual user approvals.

**Results**
The result value is the final approval disposition. This disposition depends on the approval actions take by the approvers and the approval conditions specified in the Wait for or When Anyone Rejects fields. Possible result values are:

- Approved
- Rejected
- Deleted
- Cancelled

**Input variables**

**Table 1288: Approval - User activity input variables**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approval - User When</td>
<td>Specify when this activity generates a user approval record.</td>
</tr>
<tr>
<td>Condition</td>
<td>Conditions which, if met, cause the individual approval to be generated. If the conditions are not met, the approval is skipped.</td>
</tr>
<tr>
<td>Approval - User Approvers</td>
<td>Specify the users whose approval will be requested.</td>
</tr>
<tr>
<td>Users</td>
<td>The users for the approval. Use the tree icon to select user reference fields from the current record to create approvals, such as ${assigned_to}. If no user is selected, the activity automatically sets the approval to Approved.</td>
</tr>
</tbody>
</table>

**Note:** Workflow only manages approval records generated by the Approval User activity. After starting the workflow, newly added approvals do not affect the workflow context.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groups</td>
<td>Groups whose members should also receive approvals. Note that this is different than the Approval - Group activity, which creates a group approval in addition to the individual approvals. The tree icon can be used to select group reference fields from the current record to create approvals, such as ${assignment_group}.</td>
</tr>
</tbody>
</table>

**Approval - User Condition**
Specify how the activity decides to approve or reject the approval, based on the responses from individual approvers.

**Wait for**
A choice between different approval logics to determine which individual approvals result in approval of the activity's approval. Options are:
- Anyone to approve: Any user can approve and the first approval causes the activity to complete with a result of approved.
- Everyone to approve: All users must approve (see below for how a rejection is handled).
- First response from anyone: The first approval or rejection from any user causes the activity to complete.
- Condition based on script: Each time a user approves or rejects, the Approval script is called to determine if the activity should complete.

**When anyone rejects**
A choice between different approval logics to determine which individual rejections result in rejection of the activity's approval. Options are:
- Reject the approval: Immediately complete the activity with a result of rejected.
- Wait for other responses before deciding: Wait until we get other responses before making an approval or rejection decision. This allows users to change their mind until a decision is made.

**Note:** Note that if Wait for is set to Anyone to approve then a single approval will cause the activity to complete with a result of approved even if one or more users reject.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approval Column</td>
<td>A string field for the name of the approval field on the table the workflow is running on. The default value is approval, which is the field on the Task table.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Use the field's name, not its label.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> If using any custom approval column fields and approval column journals, use Set Value activities in the workflow to set the custom Approval column fields.</td>
</tr>
<tr>
<td>Approval Journal Column</td>
<td></td>
</tr>
<tr>
<td>Approval Script</td>
<td>If the Wait for variable is set to Condition based on script this script is called to determine how to handle an approval or rejection. The script needs to set the variable answer to approved or rejected to indicate the approval status for this approval. When called, the following information is available: counts.total = total number of users that are part of this approval counts.approved = # of users that approved so far counts.rejected = # of users that rejected so far counts.requested = # of users that are pending approval counts.not_requested = # of users that are not pending approval counts.not_required = # of users that approval is not required</td>
</tr>
<tr>
<td>Approval - User Schedule</td>
<td>Specify how workflow calculates the approval record's expected start date and due date. Once you've made a selection for 'Due date based on', and 'Schedule based on', the appropriate fields will display.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Due date based on</td>
<td>Select how workflow determines the task's duration, due date, and schedule.</td>
</tr>
<tr>
<td></td>
<td>• A user specified duration: The duration is based on a user specified value.</td>
</tr>
<tr>
<td></td>
<td>• A relative duration: The duration is calculated from a relative duration (such as End of Next Business Day).</td>
</tr>
<tr>
<td></td>
<td>• A date/time or duration field: The duration is based on the value of a field on the current record.</td>
</tr>
<tr>
<td></td>
<td>• Script: The duration is returned by a script.</td>
</tr>
<tr>
<td>Duration</td>
<td>Only appears when Due date based on is set to A user specified duration</td>
</tr>
<tr>
<td></td>
<td>The specific number of days and hours.</td>
</tr>
<tr>
<td>Relative duration</td>
<td>Only appears when Due date based on is set to A relative duration</td>
</tr>
<tr>
<td></td>
<td>The general number and length of business days.</td>
</tr>
<tr>
<td>Due date field</td>
<td>Only appears when Due date based on is set to A date/time or duration field</td>
</tr>
<tr>
<td></td>
<td>The date/time or duration field.</td>
</tr>
<tr>
<td>Due date script</td>
<td>Only appears when Due date based on is set to Script</td>
</tr>
<tr>
<td></td>
<td>The script that sets 'answer' to the number of seconds for the duration.</td>
</tr>
<tr>
<td>Schedule based on</td>
<td>The basic schedule the timer uses to count working hours. If a schedule is specified, the duration will only be considered for times that are specified on the schedule. For example, if the duration is 2 hours and the workflow begins at 4:00pm on a schedule that is 8am - 5pm, then it ends at 9:00am the next day. The options are:</td>
</tr>
<tr>
<td></td>
<td>• This workflow's schedule: The schedule uses workflow context date, time, and an optional Time zone based on value.</td>
</tr>
<tr>
<td></td>
<td>• A specific schedule: The schedule uses a pre-defined Schedule and an optional Time zone based on value.</td>
</tr>
<tr>
<td></td>
<td>• A schedule field: The schedule uses a value from a table and an optional Time zone based on value.</td>
</tr>
<tr>
<td>Schedule</td>
<td>Only appears when Schedule based on is set to A specific schedule</td>
</tr>
<tr>
<td></td>
<td>The predefined Schedule from a list.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Schedule field</strong></td>
<td>A date and time or duration field for the schedule, that is associated with the table. Valid fields appear in blue on the Select the element from a tree dialog. Only appears when Schedule based on is set to A schedule field.</td>
</tr>
<tr>
<td><strong>Time zone based on</strong></td>
<td>The time zone for calculating the duration. The time zone may be based on:</td>
</tr>
<tr>
<td></td>
<td>• No time zone: Default. Workflow uses the GMT time zone.</td>
</tr>
<tr>
<td></td>
<td>• A specific time zone: A specific Time zone that you choose from a choice list.</td>
</tr>
<tr>
<td></td>
<td>• A time zone field: A Time zone field to track time duration from a field on the form. Only appears when Time zone based on is set to A specific time zone.</td>
</tr>
<tr>
<td><strong>Time zone</strong></td>
<td>Select the time zone you want from the choice list. Only appears when Time zone based on is set to A specific time zone.</td>
</tr>
<tr>
<td><strong>Time zone field</strong></td>
<td>A date and time or duration field for the schedule, that is associated with the table. Valid fields appear in blue on the Select the element from a tree dialog. Only appears when Time zone based on is set to A time zone field.</td>
</tr>
<tr>
<td><strong>Approval - Advanced</strong></td>
<td>If desired, write a script for determining additional users to request approvals from.</td>
</tr>
<tr>
<td><strong>Advanced</strong></td>
<td>Select this check box to write a script for determining additional users to request approvals from.</td>
</tr>
<tr>
<td><strong>Additional approvers script</strong></td>
<td>If the Advanced check box is selected, this script is called to determine any additional user approvals to be created. The script needs to set the variable answer to a comma-separated list of user ids and group ids or an array of user and group ids to add as approvers. For example: answer = []; answer.push('id1'); answer.push('id2');</td>
</tr>
</tbody>
</table>

**Conditions**

The following conditions determine which transition runs after this activity.
### Table 1289: Approval - User activity conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approved</td>
<td>The users approved the request based on the Wait for rules.</td>
</tr>
<tr>
<td>Rejected</td>
<td>The users rejected the request based on the Wait for rules.</td>
</tr>
<tr>
<td>Error</td>
<td>The event or condition that generates an error.</td>
</tr>
<tr>
<td>Skipped</td>
<td>The event or condition that allows a skipped approval.</td>
</tr>
</tbody>
</table>

### States

The activity state tells the workflow engine what to do with the activity.

### Table 1290: Approval - User activity states

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executing</td>
<td>The workflow engine starts the execute function of the activity.</td>
</tr>
<tr>
<td>Waiting</td>
<td>The workflow engine ignores the activity until a specific event to restart the activity is fired.</td>
</tr>
<tr>
<td>Finished</td>
<td>The activity finished running. See the result value for the outcome of the activity.</td>
</tr>
<tr>
<td>Cancelled</td>
<td>This activity, or the workflow that contains this activity, was canceled.</td>
</tr>
<tr>
<td>Error</td>
<td>A JavaScript error occurred. Review the logs for error details.</td>
</tr>
</tbody>
</table>

**Generate workflow activity**

The Generate activity immediately creates task or approval records from any task or approval activities placed after the Generate activity in the workflow path. These pre-generated tasks and approvals start when the task and approval activities are reached during flow execution. This allows a task to have a set of associated pre-generated sequential tasks or approvals, but still require them to be completed in order.

**Note:** This activity is only available when the workflow runs on a table that extends Task.

By default, the workflow does not create any tasks or approvals until it reaches them in the workflow. The Generate activity follows all transitions through the workflow to each activity. For each activity:

- If it is a task activity, creates the task and sets:
  - The State to Pending
  - The Expected Start Date
  - The Due Date

- If it is an approval activity, creates the approvals and sets:
• The approval State to Not Requested
• The Expected Start Date
• The Due Date

Expected start dates and due dates are calculated based on the Expected Duration of all of the tasks and approvals between the Generate activity and the activity being updated. In the case of a branched path (between a Branch and Join activity), the longer duration will be used for any post-branch activities.

The Generate activity can be used more than once, and any tasks or approvals will be refreshed with updated information. This is useful in situations where the list of approvers or other important information is still editable while the workflow is in process and it may be necessary to update or correct the generated approvals or tasks.

To exclude a set of activities from the Generate activity, select the Skip during generate check box on any condition and its transitions will not be followed during the generate process. By default, the following conditions have the Skip during generate check box selected:

• Rejected (for any of the approval activities)
• No condition of If activity
• Continue condition of Turnstile activity
• Incomplete condition of Join activity

**Input variables**

Input variables determine the initial behavior of the activity.

**Table 1291: Generate activity input variables**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generate approvals</td>
<td>If selected, approvals are created when running the Generate activity. If cleared, the approvals are used to compute their estimated duration, but no approvals are created.</td>
</tr>
<tr>
<td>Generate tasks</td>
<td>If selected, tasks are created when running the Generate activity. If cleared, the tasks are used to compute their estimated duration, but no tasks are created.</td>
</tr>
</tbody>
</table>

**States**

The activity state tells the workflow engine what to do with the activity.

**Table 1292: Generate activity states**

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executing</td>
<td>The activity is executing.</td>
</tr>
<tr>
<td>Finished</td>
<td>The activity finished running. See the result value for the outcome of the activity.</td>
</tr>
<tr>
<td>State</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Cancelled</td>
<td>This activity, or the workflow that contains this activity, was canceled.</td>
</tr>
</tbody>
</table>

Example

![Diagram of Generate workflow]

Figure 761: Generate workflow

In this example, the following approvals are generated:

- Approval-2
- Approval-3

Approval-4 is skipped since the Rejected condition of Approval-3 has Skip during generate selected.

Here is an example of using the Generate activity that describes the expected start and due dates:
Figure 762: Generate workflow start and due date

In this example, if the Generate activity is run on Jan 1, 2016, the following expected start dates and due dates would be set for the generated tasks.

<table>
<thead>
<tr>
<th>Task</th>
<th>Expected Start Date</th>
<th>Reason</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task 2 (1 day)</td>
<td>Jan. 2, 2016</td>
<td>Task 1 is 1 day</td>
<td>Jan. 3, 2016</td>
</tr>
<tr>
<td>Task 4 (1 day)</td>
<td>Jan. 3, 2016</td>
<td>Task 3 is 2 days</td>
<td>Jan. 4, 2016</td>
</tr>
<tr>
<td>Task 5 (1 day)</td>
<td>Jan. 4, 2016</td>
<td>Task 4 ends the latest before the Join</td>
<td>Jan. 5, 2016</td>
</tr>
</tbody>
</table>

Notice that Task 5 starts on Jan. 4, 2016 since the longest path (based on due dates) to the Join is Task 3/Task 4.

Manual Approvals workflow activity

The Manual Approvals activity watches and manages any approvals that users add manually outside of the workflow process. This activity only selects approvals that are in the Not requested state.

**Note:** This activity is only available when the workflow runs on a table that extends Task.

If there are no pending manual approvals when this activity executes, the activity immediately completes with a result of approved. This activity does not create approval records. Use this activity to pause the workflow when a user adds a manual approval to a record with an associated workflow, and it is in the Not requested state. The workflow waits for the approval to be closed before proceeding.

Results

The workflow designer can assign a result value using activity.result from within a script field of the activity. By default, the result value of the activity is the final approval disposition determined by the approval actions take by the approvers. Possible result values are:

- Approved
- Rejected
Input variables

Input variables determine the initial behavior of the activity.

Table 1293: Manual Approvals activity input variables

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wait for</td>
<td>Indicate what to wait for to indicate that the approval activity is approved or rejected. Options are:</td>
</tr>
<tr>
<td></td>
<td>• Any manual user or group approval: Any user can approve and the first approval causes the activity to complete with a result of approved.</td>
</tr>
<tr>
<td></td>
<td>• All manual user or group approvals: All users must approve (see below for how a rejection is handled).</td>
</tr>
<tr>
<td></td>
<td>• The first response from any manual approval: The first approval or rejection from any user causes the activity to complete.</td>
</tr>
<tr>
<td>When anyone rejects</td>
<td>Indicate what happens when any user rejects their approval request. Options are:</td>
</tr>
<tr>
<td></td>
<td>• Reject the approval: Immediately complete the activity with a result of rejected.</td>
</tr>
<tr>
<td></td>
<td>• Wait for other responses before deciding: Wait until we get other responses before making an approval or rejection decision. This allows users to change their mind until a decision is made.</td>
</tr>
</tbody>
</table>

In addition, if Wait for is set to Anyone to approve then a single approval will cause the activity to complete with a result of approved even if one or more users reject.

Conditions

The conditions determine which transition runs after this activity.
Table 1294: Manual Approvals activity conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approved</td>
<td>The users from the groups have approved the request based on the Wait for rules.</td>
</tr>
<tr>
<td>Rejected</td>
<td>The users from the groups have rejected the request based on the Wait for rules.</td>
</tr>
</tbody>
</table>

**States**

The activity state tells the workflow engine what to do with the activity.

Table 1295: Manual Approvals activity states

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executing</td>
<td>The workflow engine starts the execute function of the activity.</td>
</tr>
<tr>
<td>Waiting</td>
<td>The workflow engine ignores the activity until a specific event to restart the activity is fired.</td>
</tr>
<tr>
<td>Finished</td>
<td>The activity finished running. See the result value for the outcome of the activity.</td>
</tr>
<tr>
<td>Cancelled</td>
<td>This activity, or the workflow that contains this activity, was canceled.</td>
</tr>
<tr>
<td>Error</td>
<td>A JavaScript error occurred. Review the logs for error details.</td>
</tr>
</tbody>
</table>

*Rollback To workflow activity*

The Rollback To activity transitions directly to the activity specified by the outgoing transition line arrow.

**Note:** This activity is only available when the workflow runs on a table that extends Task.

Rollback To determines which activities to reset based on the actual workflow sequence (transition line attachments) of activities between itself and the transitioned to activity, not the execution order. Rollback To then marks all the approvals that have transitioned between the rollback and the transitioned to activity as Not Yet Requested and the tasks as either Open or Pending.

Use the Rollback To activity for all workflows in which multiple rollbacks are required. Rollback To has no variables.

**Conditions**

The conditions determine which transition runs after this activity.
Table 1296: Rollback To activity conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always</td>
<td>The event or condition that causes the approval to revert to the previous workflow step.</td>
</tr>
<tr>
<td>Error</td>
<td>The event or condition that generates an error.</td>
</tr>
<tr>
<td>Skipped</td>
<td>The event or condition that allows a skipped approval.</td>
</tr>
</tbody>
</table>

**States**

The activity state tells the workflow engine what to do with the activity.

Table 1297: Rollback To activity states

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executing</td>
<td>The workflow engine starts the execute function of the activity.</td>
</tr>
<tr>
<td>Waiting</td>
<td>The workflow engine ignores the activity until a specific event to restart the activity is fired.</td>
</tr>
<tr>
<td>Finished</td>
<td>The activity finished running. See the result value for the outcome of the activity.</td>
</tr>
<tr>
<td>Cancelled</td>
<td>This activity, or the workflow that contains this activity, was canceled.</td>
</tr>
<tr>
<td>Error</td>
<td>A JavaScript error occurred. Review the logs for error details.</td>
</tr>
</tbody>
</table>

Rollback To behavior

The Rollback To activity transitions directly to the activity specified by the transition line arrow.

Use the Rollback To activity for all workflows that use multiple or nested rollbacks. Rollback To resets the targeted task (the direct transition) to Open. All tasks that have executed between the Rollback To activity and the targeted task (rolled back task) are set to Pending.

(0) Begin
(1) Log Message
(2) Task 1
(3) Task 3
(4) Task 2
(5) Timer
(6) Approval 1
(7) Roll back to first task
(8) Task 1
(9) Task 2
(10) Approval 1
(11) Log approval
(12) Join
(14) Send email
(15) End

Figure 763: Rollback to workflow

Transition history

The state of (3) Task 3 does not change, since this activity does not directly transition from the rollback target activity. To see what activities were rolled back, select the Workflow Transition History related list and look at the Rolled back column.

The Rollback To activity (7) updates the following activities:
(8) Task 1: reset to Open
(9) Task 2: reset to Pending
(10) Approval 1: reset to Not Yet Requested

Figure 764: Rollback To workflow transition

Rollback To activity

When conditions in a workflow trigger a Rollback To activity, the workflow moves processing backward to a specified activity in the workflow and resets certain activities that have already executed back to their original state. This is useful when handling an unexpected failure or as part of a programmed logical flow.

When an activity is reset during a workflow rollback, the following happens:

- Approvals are reset to Not Requested.
- Tasks are reset to either Open or Pending. A rollback workflow path cannot create new tasks.

Activities that perform external system operations, such as deleting a file or sending an email, are not rolled back. Only approval and task activity states are reset.
A workflow can contain a single rollback, multiple rollbacks, or nested rollbacks in more complex workflows. The Rollback To activity resets activities based on the actual workflow sequence (transition line attachments) of activities between itself and the transitioned to activity, rather than using the execution order to determine where processing should restart.

**Condition Workflow activities**

Condition activities provide conditional branching and logical operation functionality for workflows.

*If workflow activity*

The If activity checks a condition or script to determine if a Yes or No transition should be taken.

If the workflow creator specifies both the Condition and the Advanced script, both must evaluate successfully for activity to take the Yes transition.

**Results**

The workflow designer can assign a result value using activity.result from within the Script field on the activity record. By default, the result value of the activity is the final result of the condition or script specified. Possible result values are:

- Yes
- No

**Input variables**

The following variables determine the behavior of the activity.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition</td>
<td>If specified and the current record matches the condition, the Yes transition is taken.</td>
</tr>
<tr>
<td>Advanced and Script</td>
<td>To specify a script, select the Advanced check box. You may then enter a script that is evaluated. If your script sets the variable answer to yes, then the Yes transition is taken. Otherwise, the No transition is taken.</td>
</tr>
</tbody>
</table>

**Conditions**

The following conditions determine which transition comes after the activity.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Taken when the condition, if specified, matches and the Advanced script, if specified, returns yes.</td>
</tr>
<tr>
<td>Condition</td>
<td>Taken when either the condition does not match or the Advanced script, if specified, returns no.</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>

**States**

The activity state tells the workflow engine what to do with the activity.

**Table 1300: If activity states**

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executing</td>
<td>The workflow engine knows to start the onExecute function of the activity.</td>
</tr>
<tr>
<td>Waiting</td>
<td>The workflow engine ignores the activity until a specific event to restart the activity is fired.</td>
</tr>
<tr>
<td>Finished</td>
<td>The activity finished running. See the result value for the outcome of the activity.</td>
</tr>
<tr>
<td>Cancelled</td>
<td>This activity, or the workflow that contains this activity, was canceled.</td>
</tr>
<tr>
<td>Error</td>
<td>A JavaScript error occurred. Review the logs for error details.</td>
</tr>
</tbody>
</table>

*Switch workflow activity*

The Switch activity checks if the value of a passed field or variable is equivalent to one of several case values.

The switch activity behavior is similar to a switch statement in Java.

When creating a switch activity, select a Variable or Field to check against activity conditions for a matching field value. When the value passed in this variable or field matches the value defined in the Condition field of the activity condition, the workflow progresses through that activity condition.

**Results**

The variable or field selected in the Variable or Field activity variable determines the possible result values.

**Input variables**

The following variables determine the behavior of the activity.

**Table 1301: Switch activity input variables**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Select Variable or Field as the type of value to check against available conditions. This selection sets the label and available options for the other field.</td>
</tr>
</tbody>
</table>
### Field

<table>
<thead>
<tr>
<th>Variable or Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable or Field</td>
<td>Select the source of the value compared against the switch activity conditions. The field label and available options depend on the Type selection.</td>
</tr>
<tr>
<td>Variable: select any service catalog variable.</td>
<td></td>
</tr>
<tr>
<td>Field: select any field from the Table defined in the workflow properties.</td>
<td></td>
</tr>
</tbody>
</table>

### States

The activity state tells the workflow engine what to do with the activity.

#### Table 1302: Switch activity states

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executing</td>
<td>The workflow engine knows to start the onExecute function of the activity.</td>
</tr>
<tr>
<td>Waiting</td>
<td>The workflow engine ignores the activity until a specific event to restart the activity is fired.</td>
</tr>
<tr>
<td>Finished</td>
<td>The activity finished running. See the result value for the outcome of the activity.</td>
</tr>
<tr>
<td>Cancelled</td>
<td>This activity, or the workflow that contains this activity, was canceled.</td>
</tr>
<tr>
<td>Error</td>
<td>A JavaScript error occurred. Review the logs for error details.</td>
</tr>
</tbody>
</table>

### Example

You can create a switch activity that sets different field values on an incident based on the Assignment group of the incident record.
Figure 765: Switch activity example

The Field selected is the incident Assigned to field.
Figure 766: Switch activity Field

If the value of the Assigned to field of the workflow-triggering incident is Service Desk or Field Services, the workflow populates values on the incident record before continuing. If the Assigned to value is Hardware, the workflow continues without populating any field values.

Condition type (Standard, Else, or Error) is used. For more information, see *Manage workflow activity conditions* on page 3461.
**Figure 767: Hardware group condition**

*Wait for condition workflow activity*

The Wait for condition activity causes the workflow to wait at this activity until the current record matches the specified condition.

The workflow evaluates the Wait for condition activity each time the current record is updated. Use this activity to pause a workflow indefinitely until a particular criteria is met by a record update. To pause a workflow for a timed duration see *Timer workflow activities* on page 3416.

For workflow to consider the condition met, all conditions specified – whether in the builder or in a script – must be true.
**Note:** A Wait for condition activity should only be used to wait for an external event such as a record update, and not one from a workflow setting a value. If you have a workflow setting a value and want to wait for that same field to be seen as 'changed,' try inserting a one-second timer.

**Results**

The workflow designer can assign a result value using activity.result from within a script field of the activity. The activity transitions when the result value is true.

**Input variables**

The following variables determine the behavior of the activity.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition</td>
<td>The workflow is paused at this activity until this condition matches the current record.</td>
</tr>
<tr>
<td>Condition script</td>
<td>If specified, the workflow is paused at this activity until this script sets the answer variable to true.</td>
</tr>
</tbody>
</table>

**States**

The activity state tells the workflow engine what to do with the activity.

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executing</td>
<td>The workflow engine knows to start the onExecute function of the activity.</td>
</tr>
<tr>
<td>Waiting</td>
<td>The workflow engine ignores the activity until a specific event to restart the activity is fired.</td>
</tr>
<tr>
<td>Finished</td>
<td>The activity finished running. See the result value for the outcome of the activity.</td>
</tr>
<tr>
<td>Cancelled</td>
<td>This activity, or the workflow that contains this activity, was canceled.</td>
</tr>
<tr>
<td>Error</td>
<td>A JavaScript error occurred. Review the logs for error details.</td>
</tr>
</tbody>
</table>

*Wait for WF Event workflow activity*

The Wait for WF Event activity causes the workflow to wait at this activity until the specified event is fired.

Use this activity to wait for another activity to fire an event. Events from other activities are fired in a script using the workflow.fireEvent('eventName') API call.
Results

The workflow designer can assign a result value using `activity.result` from within a script field of the activity. This activity transitions when the specified event fires.

Input variables

The following variables determine the behavior of the activity.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wait for Event</td>
<td>An event name to trigger the workflow.</td>
</tr>
</tbody>
</table>

States

The activity state tells the workflow engine what to do with the activity.

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executing</td>
<td>The workflow engine knows to start the <code>onExecute</code> function of the activity.</td>
</tr>
<tr>
<td>Waiting</td>
<td>The workflow engine ignores the activity until a specific event to restart the activity is fired.</td>
</tr>
<tr>
<td>Finished</td>
<td>The activity finished running. See the result value for the outcome of the activity.</td>
</tr>
<tr>
<td>Cancelled</td>
<td>This activity, or the workflow that contains this activity, was canceled.</td>
</tr>
<tr>
<td>Error</td>
<td>A JavaScript error occurred. Review the logs for error details.</td>
</tr>
</tbody>
</table>

Notify workflow activities

Notify workflow activities manage calls and SMS messages in Notify.

All Notify workflows that manage a phone call must run on the `notify_call` table. Call-related Notify activities can be added only to workflows where the `Table` field value is `Notify Call [notify_call]`.

You can identify if an outbound call was answered by a human or by an answering machine from within a Notify workflow by evaluating the `current.is_human` variable, such as with an `If` workflow activity. This variable is set by the telephony provider when an outbound call is answered. This variable is always true for inbound calls.

**Note:** Do not add a Timer activity between multiple Notify activities that interact with active phone calls.
Important: When creating a Notify workflow, set the workflow If condition matches field to -- None --. Notify controls which workflow to run based on the configured number groups.

Forward call workflow activity
The Forward Call activity forwards a Notify call to an E.164-compliant phone number.

If the person receiving a forwarded call hangs up, the forward call activity completes and transitions to the next activity. Any further Notify activities in the workflow run for the caller only.

Input variables

Input variables determine the initial behavior of the activity.

Table 1307: Input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phone number to call</td>
<td>Enter the phone number to forward the call to.</td>
</tr>
<tr>
<td>Timeout (in seconds)</td>
<td>Enter the amount of time to wait for the call to be answered before hanging up.</td>
</tr>
<tr>
<td>Record</td>
<td>Select this check box to record the conversation.</td>
</tr>
</tbody>
</table>

Conditions

The conditions determine which transition comes after this activity. The forward call activity does not specify any conditions by default.

You can add an error condition to this activity. The activity transitions through the error condition if the phone number to call is invalid.

Input workflow activity
The Input activity creates a phone menu by presenting a list of options on a Notify call.

Input Variables

Input variables determine the initial behavior of the activity.

Table 1308: Input Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of digits</td>
<td>Specify the maximum number of digits the caller can enter. A caller can enter fewer digits than the maximum and press the Finish key to complete the entry.</td>
</tr>
<tr>
<td>Finish key</td>
<td>Specify the key a caller can press on their phone when finished selecting a menu option.</td>
</tr>
<tr>
<td>Timeout (in seconds)</td>
<td>Specify the amount of time to wait before closing the menu automatically when the caller does not select a menu option.</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
</tr>
<tr>
<td>Advanced</td>
<td>Select this check box to use a script to build the phone menu, instead of using the activity conditions.</td>
</tr>
</tbody>
</table>
| Script   | Define the script to build the phone menu. The script must specify an answer variable as a JavaScript object with the following format:  
```javascript
answer = {
  1: {
    "say": "https://some_url.com/options/one.mp3",
    "myCustomData": "some data here"
  },
  2: {
    "say": "type 2 to speak to a representative",
    "language": "en-US",
    "myCustomData": "some more data here"
  }
};
```

The script may specify either a text-to-speech string and language code or the URL of a prerecorded message for each entry. You can also add optional attributes to store related information, such as `myCustomData` in the example above.

**Conditions**

The conditions determine the transition that comes after this activity.

The input activity does not specify any conditions by default. You must define conditions to build the phone menu. Each condition is one option on the phone menu. Notify reads the text from each condition Name to the caller, up to 100 characters per condition.

You can specify a language for each condition by prefixing the message with the language code, in the format `xx-XX:<Message>`. For example, add `fr-CA:` for Canadian French. Available languages are stored on the Notify Language `[notify_language]` table.

The condition that the activity transitions through depends on the digits entered by the caller. Set the condition `Condition` value to `parseInt(workflow.scratchpad.digits) == <expected digits>`.

You can add an error condition to this activity. The activity transitions through the error condition if the advanced script returns an invalid value, or if the text to say for a condition is empty.

**Scratchpad Entries**

The activity uses the workflow scratchpad to write persistent values.
Table 1309: Values written to scratchpad

<table>
<thead>
<tr>
<th>Entry</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>workflow.scratchpad.digits</td>
<td>The digits entered by the caller, as a string.</td>
</tr>
</tbody>
</table>
| workflow.scratchpad.menu<activity name>  | The entire answer variable, if using the advanced script option. You can access this menu from other activities after this activity successfully executes. For example, if the activity name is choices, you can access values from the menu using:  
  ```javascript
  var previousActivity = "choices";
  var choicesMenu = workflow.scratchpad.menu[previousActivity];
  var menuItem = choicesMenu[workflow.scratchpad.digits];
  // Selects the menu item based on the caller's input.
  var selectedValue = menuItem.myCustomData; //get the custom data for the selected menu item.
  ``` |

**Hangup workflow activity**

The Hangup activity disconnects an active Notify phone call.

You can use the hangup activity to disconnect only calls that have been answered. Use the reject activity to disconnect calls that have not been answered.

**Play workflow activity**

The Play activity plays a sound file on a Notify call.

**Input Variables**

Input variables determine the initial behavior of the activity.

Table 1310: Input Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td>Enter the URL of a sound file to play. If the URL is inaccessible, or if the audio file mime type is not supported by the telephony provider, the play activity is skipped.</td>
</tr>
<tr>
<td>Loop</td>
<td>Enter the number of times the sound file should play.</td>
</tr>
</tbody>
</table>

**Conditions**

The conditions determine which transition comes after this activity. The play activity does not specify any conditions by default.
You can create an error condition to handle errors with the sound file. The activity transitions through the error condition if the specified sound file is not available, or has an unsupported mime type. Supported mime types are listed on the Notify Audio MIME Types [notify_mime_type] table.

Record workflow activity
The Record workflow activity records audio from a user on a Notify call.

Input Variables

Input variables determine the initial behavior of the activity.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max duration (in seconds)</td>
<td>Enter the maximum duration, in seconds, allowed for a recording.</td>
</tr>
<tr>
<td>Timeout (in seconds)</td>
<td>Enter the amount of time to wait before ending a recording automatically when the caller is silent.</td>
</tr>
<tr>
<td>Finish Key</td>
<td>Specify the key a caller can press on their phone to end the recording.</td>
</tr>
</tbody>
</table>

Scratchpad Entries

The activity uses the workflow scratchpad to store persistent values.

The record activity adds the recording variable to the workflow scratchpad. This variable stores metadata about the recording, such as URI, ID, and duration. You can access the following values from this variable.

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>recording.recordingDuration</td>
<td>The duration of the recording, in seconds.</td>
</tr>
<tr>
<td>recording.from_number</td>
<td>The caller's phone number, including country code.</td>
</tr>
<tr>
<td>recording.notify_number</td>
<td>The Notify phone number used to respond to the call, including country code.</td>
</tr>
<tr>
<td>recording.recordingID</td>
<td>The ID used by the telephony provider to identify the recording.</td>
</tr>
<tr>
<td>recording.recordingURL</td>
<td>The URL from the telephony provider to access the recording.</td>
</tr>
</tbody>
</table>

Reject workflow
The Reject workflow activity rejects an incoming Notify call.

You can use the reject activity to disconnect only calls that have not yet been answered. Use the hang up activity to disconnect calls that have been answered.
Input variables

Input variables determine the initial behavior of the activity.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>reason</td>
<td>Select a reason for rejecting the call, such as busy.</td>
</tr>
</tbody>
</table>

Say workflow activity
The say workflow activity allows you to play a message, using text to speech, on a Notify call.

Input variables

Input variables determine the initial behavior of the activity.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text to say</td>
<td>Specify the text to read.</td>
</tr>
<tr>
<td>Language</td>
<td>Select the language and locale to use when reading text.</td>
</tr>
<tr>
<td>Advanced</td>
<td>Select this check box to use a script to define the language and message, instead of using the Text to say and Language values.</td>
</tr>
<tr>
<td>Script</td>
<td>Define a script to set what text is read on the call. The script must return a string that defines the language and the text to read. For example, to play an English-language message, return <code>{language: 'en-US', text: 'Text to read'}</code>.</td>
</tr>
</tbody>
</table>

Forward to notify client workflow activity
The forward to notify client workflow activity connects a phone call to a Notify WebRTC client.

Input variables

Input variables determine the initial behavior of the activity.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User</td>
<td>Select the user to connect the call to.</td>
</tr>
<tr>
<td>Advanced</td>
<td>Select this check box to use a script to determine which client to connect to, instead of using the User variable.</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>----------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Script</td>
<td>Define a script that controls which client to connect to. This script should return a GlideRecord for a single User [sys_user] record.</td>
</tr>
<tr>
<td>Timeout (in seconds)</td>
<td>Enter the amount of time to wait for the call to be connected before hanging up.</td>
</tr>
<tr>
<td>Record</td>
<td>Select this check box to record the call.</td>
</tr>
</tbody>
</table>

**Conditions**

The conditions determine which transition comes after this activity. The Forward to Notify Client activity does not specify any conditions by default.

You can add an error condition to this activity. The activity transitions through the error condition if there is an issue with the Notify client.

*Call workflow activity*

The Call activity makes outbound phone calls using a Notify workflow.

**Input variables**

Input variables determine the initial behavior of the activity.

**Table 1316: Input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notify Number</td>
<td>The Notify phone number to make the call from. When you initiate a call, the outgoing call workflow for the number group associated with this number runs.</td>
</tr>
<tr>
<td>Phone number to call</td>
<td>The E.164-compliant phone number to call.</td>
</tr>
<tr>
<td>Advanced</td>
<td>Select this check box to use a script to determine number to call, and the Notify number to call from instead of using the Phone number to call and Notify Number variables.</td>
</tr>
<tr>
<td>Script</td>
<td>Define a script that controls which number to call. This script should return a string listing the Notify number sys_id, as well as the phone number to call, such as {notify_number: 'sys_id', phone_number: '+316...'}</td>
</tr>
</tbody>
</table>
You can add an error condition to this activity. The activity transitions through the error condition if the call could not be set up due to invalid data returned by the advanced script.

Join conference call workflow activity
The Join Conference Call activity connects an incoming or outgoing call to a Notify conference call.

Notify includes the workflows Notify: (Re)join Conference Call and Notify: Join Conference Call Via SMS to demonstrate how to use the join conference call activity to connect inbound and outbound calls, and inbound SMS messages to a conference call.

Input variables
Input variables determine the initial behavior of the activity.

Table 1317: Input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced</td>
<td>Select this check box to display advanced configuration options.</td>
</tr>
<tr>
<td>Script</td>
<td>Specify advanced configuration options using JavaScript, such as if the new participant should be muted upon joining the conference call. You can access values from the workflow scratchpad.</td>
</tr>
</tbody>
</table>

Conditions
The conditions determine which transition comes after this activity. The join conference call activity does not specify any conditions by default.

You can add an error condition to this activity. The activity transitions through the error condition if the conference_call scratchpad variable is not set.

Scratchpad entries
The activity uses the workflow scratchpad to read persistent values.
Table 1318: Values read from scratchpad

<table>
<thead>
<tr>
<th>Scratchpad variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>workflow.scratchpad.conference_call</code></td>
<td>A GlideRecord for a single conference call record. A call processed by this activity is added to this conference call. If this value is not specified, the join conference call activity will log an error.</td>
</tr>
<tr>
<td></td>
<td>When initiating an outgoing call workflow using the Notify API call(String notifyPhoneNumber, String toPhoneNumber, GlideRecord conferenceCall) method, this scratchpad value is set automatically to the conference call GlideRecord. For incoming call workflows, or workflows initiated using a different mechanism, you must explicitly set this scratchpad value.</td>
</tr>
</tbody>
</table>

Enable the hangupOnStar attribute

System administrators can enable the hangupOnStar attribute and use it in the Join Conference Call workflow activity. When hangupOnStar is enabled (set to true), participants in a conference call can press the * button to disconnect from the call. Control is returned to the workflow, which can be used to trigger customer-defined actions.

To enable the hangupOnStar attribute:

1. Navigate to Workflow Administration Workflow Versions.
2. Open the Notify: (Re)join Conference Call workflow.
3. Click the Show Workflow related link.
4. To modify the workflow, click the WorkFlow Actions icon and click Checkout.
5. Open the Join Conference Call workflow activity.
6. Enable the Advanced check box to display the Script field.
7. Set the hangupOnStar attribute to true. The default setting is false.
8. Click Update.
9. Click the WorkFlow Actions icon and click Publish to save the changes.

Send SMS workflow activity
The send SMS workflow activity to send short text messages using Notify to users' phones.

Input variables

Input variables determine the initial behavior of the activity.
### Table 1319: Input variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>From</td>
<td>Select the Notify phone number to use to send the SMS message.</td>
</tr>
<tr>
<td>Advanced</td>
<td>Select this check box to use JavaScript to determine which numbers to send the message to, and the Notify number to use to send the message.</td>
</tr>
<tr>
<td>To</td>
<td>Select any number of users to send the message to. The user record must have an E.164-compliant phone number or notification device configured for SMS messages.</td>
</tr>
<tr>
<td>To (groups)</td>
<td>Select any number of groups to send the message to. All members of that group with an E.164-compliant phone number or SMS notification device receive the message.</td>
</tr>
<tr>
<td>Message</td>
<td>Enter the message to send. You can add field values from the current record by using the Select variables box. You can also add values from the workflow scratchpad. If a field and a scratchpad variable have the same name, the field value is used. Because you can use variables in this message, it is not possible to determine the length of the message at design time. If the activity sends a message that is longer than supported by the telephony provider, the message is truncated and the instance logs a warning.</td>
</tr>
<tr>
<td>To (script)</td>
<td>Enter a script to determine which numbers to send the message to, and the Notify number to use to send the message. The script should return a JavaScript object with the format `{notify_number: '...sys_id...', users: [...], groups: [...], numbers: [...]} Specify the users or groups to send the message to as an array of sys_id values. Specify other numbers as an array of E.164-compliant phone numbers. This field appears only if Advanced is selected.</td>
</tr>
</tbody>
</table>

### Conditions

The conditions determine which transition comes after this activity. This activity does not specify any conditions by default.

You can add an error condition to this activity. The activity transitions through the error condition if the Notify number used to make the call is not configured correctly or unable to send SMS messages, or if an error occurs while sending the SMS.
Queue workflow activity
The Queue activity places an active Notify call in a queue.

Add the Queue activity to a workflow on the Notify Call [notify_call] table to put the current call on hold. This activity does not specify any input variables.

The queue that the call is added to is given a random ID.

Workflow notification activities
Notification workflow activities notify users of events that occur during the workflow.

Create Event workflow activity
The Create Event activity adds an event to the event queue, but does not immediately fire the event.

The event processor typically processes the event within one minute. This activity triggers any business rules or email notifications that would normally be triggered by the event.

Results
Finished: the activity added the event to the event queue.

Input variables

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Event name</td>
<td>The name of the event to create. From the Event Name lookup list, select the event to add to the queue. If the event requires parameters, specify them in the Parameter script field.</td>
</tr>
<tr>
<td>Parameter 1</td>
<td>The first parameter of the event.</td>
</tr>
<tr>
<td>Parameter 2</td>
<td>The second event parameter.</td>
</tr>
</tbody>
</table>

Note: If this parameter is a string value, it must be within quotes (" ").

Notification workflow activity
The Notification activity sends an email or SMS message to specified users or groups.
Input variables

Table 1321: Notification activity input variables

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Addressees</td>
<td></td>
</tr>
<tr>
<td>To</td>
<td>The users who will be recipients of the email.</td>
</tr>
<tr>
<td>To (groups)</td>
<td>The members of the groups that will be recipients of the email.</td>
</tr>
<tr>
<td>Advanced</td>
<td>If selected, the script in the To (script) field is called to specify additional recipients of the email.</td>
</tr>
<tr>
<td>To (script)</td>
<td>If Advanced is selected, this script is called and should set the variable answer to a comma-separated list of user or group sys_ids that you want to add as recipients of the email.</td>
</tr>
</tbody>
</table>

Message

<table>
<thead>
<tr>
<th>Subject</th>
<th>The subject line of the email.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message</td>
<td>The email body that is sent.</td>
</tr>
</tbody>
</table>

  To include the value of a field in the message body, place the cursor at the point in the text where you want the field's value inserted. Then click the + icon next to Fields and select the field you want.

States

The activity state tells the workflow engine what to do with the activity.

Table 1322: Notification activity states

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executing</td>
<td>The workflow engine knows to start the run function of the activity.</td>
</tr>
<tr>
<td>Finished</td>
<td>The activity finished running. See the result value for the outcome of the activity.</td>
</tr>
<tr>
<td>Cancelled</td>
<td>This activity, or the workflow that contains this activity, was canceled.</td>
</tr>
</tbody>
</table>

Timer workflow activities

Timer activities pause workflows for set periods of time.

SLA Percentage Timer workflow activity

The SLA Percentage Timer activity pauses the workflow for a duration equal to a percentage of an SLA.
A workflow must run on the Task SLA table to use this activity.

**Results**

<table>
<thead>
<tr>
<th>Result</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete</td>
<td>The activity successfully reached the specified duration</td>
</tr>
<tr>
<td>Cancelled</td>
<td>The activity or workflow was canceled before the timer reached the specified duration</td>
</tr>
</tbody>
</table>

**Input variables**

Input variables determine the initial behavior of the activity.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>The duration to pause the workflow for, as a percentage of the current SLA</td>
</tr>
</tbody>
</table>

**States**

The activity state tells the workflow engine what to do with the activity.

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executing</td>
<td>The activity is in this state very briefly while initializing, after which it immediately changes to Waiting.</td>
</tr>
<tr>
<td>Waiting</td>
<td>The workflow engine waits until the SLA reaches the specified percentage. The engine then transitions the workflow to the next activity.</td>
</tr>
<tr>
<td>Finished</td>
<td>The activity finished running. See the result value for the outcome of the activity.</td>
</tr>
<tr>
<td>Cancelled</td>
<td>This activity, or the workflow that contains this activity, was canceled.</td>
</tr>
<tr>
<td>Error</td>
<td>A JavaScript error occurred. Review the logs for error details.</td>
</tr>
</tbody>
</table>

**Timer workflow activity**

The Timer activity pauses the workflow for a specified period of time.
This duration can be an absolute time value or a relative value based on a defined schedule. It is best to adjust the Duration so the workflow can progress in a timely manner. To pause a workflow indefinitely until a condition is met, see wait for condition.

Results

<table>
<thead>
<tr>
<th>Result</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete</td>
<td>The activity successfully reached the specified duration.</td>
</tr>
<tr>
<td>Cancelled</td>
<td>The activity or workflow was canceled before the timer reached the specified duration.</td>
</tr>
</tbody>
</table>

Input variables

Input variables determine the initial behavior of the activity.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timer Information</td>
<td>How the timer duration is computed. The options are:</td>
</tr>
<tr>
<td>Timer based on</td>
<td>• A user specified duration: The duration is based on the Duration fields, such as days and hours.</td>
</tr>
<tr>
<td></td>
<td>• A relative duration: The duration is based on the Relative duration (such as End of Next Business Day) and Wait fields.</td>
</tr>
<tr>
<td></td>
<td>• A date/time or duration field: The duration is based on the Field value and the Wait field.</td>
</tr>
<tr>
<td></td>
<td>• Script: The duration is based on a script that returns the number of seconds.</td>
</tr>
<tr>
<td>Duration</td>
<td>The specific number of days and hours to wait before proceeding to the next activity in the workflow.</td>
</tr>
<tr>
<td>Appears only when Timer based on is A user specified duration.</td>
<td></td>
</tr>
<tr>
<td>Relative duration</td>
<td>The general number and length of business days to wait before progressing to the next workflow activity.</td>
</tr>
<tr>
<td>Appears only when Timer based on is A relative duration</td>
<td></td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| Wait  | An additional timer adjustment when Timer based on is A relative duration or A date/time or duration field. The options are:  
- The full duration: No modification of the calculated duration.  
- A % of the duration: The duration is adjusted by multiplying the number of seconds by the (Percentage / 100).  
- Some time before: The duration is shortened by the Time before days and hours.  
- Some time after: The duration is lengthened by the Time after days and hours. |
<p>| Percentage | The Wait percentage value when Timer based on is A relative duration or A date/time or duration field. |
| Time before | The modifier time value when Wait is Some time before. |
| Time after | The modifier time value when Wait is Some time after. |
| Field | The date/time or duration field that contains the elapsed wait-time before moving to the next workflow activity. |
| Script | The script that sets 'answer' to the number of seconds for the duration. |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
</table>
| Schedule based on                         | The basic schedule the timer uses to count working hours. If a schedule is specified, the duration will only be considered for times that are specified on the schedule. For example, if the duration is 2 hours and the workflow begins at 4:00pm on a schedule that is 8am - 5pm, then it ends at 9:00am the next day. The options are:  
  • This workflow's schedule: The schedule uses workflow context date, time, and an optional time zone based on value.  
  • A specific schedule: The schedule uses a pre-defined Schedule and an optional Time zone based on value.  
  • A schedule field: The schedule uses a value from a table and an optional Time zone based on value. |
| Schedule                                   | The pre-defined Schedule from a list.                                                                                                      |
| Schedule field                             | A date and time or duration field for the schedule, that is associated with the table. Valid fields appear in blue on the Select the element from a tree dialog. |
| Timer Time Zone                            |                                                                                                                                            |
| Time zone based on                         | The time zone for calculating the duration. The time zone may be based on:  
  • No time zone: Default. Workflow uses the GMT time zone.  
  • A specific time zone: A predefined Time zone.  
  • A time zone field: A Time zone field to track time duration from a field on the form. |
| Time zone                                  | The predefined time zone.                                                                                                                   |
| Time zone field                            | A date and time or duration field for the schedule, that is associated with the table. Valid fields appear in blue on the Select the element from a tree dialog. |

**States**

The activity state tells the workflow engine what to do with the activity.
### Table 1328: Timer activity states

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executing</td>
<td>The Timer activity is in this state very briefly while initializing, after which it immediately changes to Waiting.</td>
</tr>
<tr>
<td>Waiting</td>
<td>The workflow engine waits until the timer reaches the specified duration. The engine then transitions the workflow to the next activity.</td>
</tr>
<tr>
<td>Finished</td>
<td>The activity finished running. See the result value for the outcome of the activity.</td>
</tr>
<tr>
<td>Cancelled</td>
<td>This activity, or the workflow that contains this activity, was canceled.</td>
</tr>
<tr>
<td>Error</td>
<td>A JavaScript error occurred. Review the logs for error details.</td>
</tr>
</tbody>
</table>

**Example**

You can use a Timer activity to pause the workflow until the end of the business day.
Figure 768: Timer example

In this example, the script evaluates the time between the now variable and the eod variable. The eod variable is defined, in 24 hour time, as 4:00 PM. The script then sets the answer variable to the difference between these variables, in seconds, and logs a message.

// get now and calc end of day (4:00pm)

var now = new Date();

var eod = new Date();
eod.setHours(16);
eod.setMinutes(0);
eod.setSeconds(0);

answer = (eod.getTime() - now.getTime()) / 1000;

workflow.debug('Timer will fire @: ' + eod + ' (' + (answer/60) + ' minutes from now');
Task workflow activities

Task activities create and modify workflow tasks. Task activities are only available when the workflow runs on a table that extends Task.

Add Worknote workflow activity
The Add Worknote activity adds text to the Worknotes field of the current incident record. A workflow must run on the Incident table to use this activity.

Input variables

Table 1329: Add Worknote activity input variables

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Note</td>
<td>The text to add to the incident record.</td>
</tr>
</tbody>
</table>

Attachment Note workflow activity
The Attachment Note activity adds an attachment to the current record.

Note: This activity is only available when the workflow runs on a table that extends Task.

This activity allows the use of irregular HTML tags to reference attachments, specifically the [code] tag. Entries in a journal field that use irregular HTML do not work if the glide.ui.allow_deep_html_validation property is true. This property is set to false by default.

Results

• Finished: the activity added the attachment to the record.

Input variables

The following variables determine the behavior of the activity.

Table 1330: Attachment Note activity input variables

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>When this activity runs, it makes a note on the current record that a file has been attached. Specify the field on the current record in which you want this note to appear. The options are:</td>
</tr>
<tr>
<td>Field</td>
<td>• none (defaults to Work Notes)</td>
</tr>
<tr>
<td></td>
<td>• Additional Comments</td>
</tr>
<tr>
<td></td>
<td>• Work notes</td>
</tr>
</tbody>
</table>

Attachment note information
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attachment Name</td>
<td>When this activity runs, it creates a .txt file with the name you specify in this field.</td>
</tr>
<tr>
<td>Attachment Data</td>
<td>The content of the .txt file attachment. It can be in plain text or use variables to extract specific data from a table.</td>
</tr>
</tbody>
</table>

**Catalog Task workflow activity**

The Catalog Task activity creates a service catalog task record.

**Note:** This activity is only available when the workflow runs on a table that extends Task.

A user must complete the catalog task. This activity is available only for workflows running on the Catalog Request Item `[sc_req_item]` table.

**Results**

You can assign a result value using `activity.result` from within a script field of the activity. The final State value of the catalog task record determines the result value for the Create Task activity. Possible result values are:

- Closed complete
- Closed incomplete
- Closed skipped
- Deleted
- Cancelled

**Input fields**

The values you enter in the following fields determine the behavior of the activity.

**Table 1331: Catalog task activity information**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task Table</td>
<td>The table on which this activity runs. In most cases, leave set to the default value: <code>[sc_req_item]</code>.</td>
</tr>
<tr>
<td>Priority</td>
<td>The value you want assigned to the Priority field for the new task.</td>
</tr>
<tr>
<td>Wait for completion</td>
<td>If selected, the workflow activity waits for the task to complete before continuing. If cleared, the task is created but the workflow proceeds.</td>
</tr>
</tbody>
</table>

**Catalog Task Record Settings**

The following fields specify the field values that this activity sets for the catalog task it creates.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task value from</td>
<td>Specify how you want to populate fields on the new task.</td>
</tr>
<tr>
<td></td>
<td>• Fields: a predefined set of fields including Fulfillment group, Assigned to, Short description and Instructions.</td>
</tr>
<tr>
<td></td>
<td>• Template: an existing template for the selected task table.</td>
</tr>
<tr>
<td></td>
<td>• Values: values that you specify using a Set Values widget.</td>
</tr>
<tr>
<td></td>
<td>After you select a value for Task value from, additional fields specific to that value appear on the form.</td>
</tr>
<tr>
<td>Fulfillment group</td>
<td>Only appears when Task value from is set to Fields</td>
</tr>
<tr>
<td>Assigned to</td>
<td>Only appears when Task value from is set to Fields</td>
</tr>
<tr>
<td>Short description</td>
<td>Only appears when Task value from is set to Fields</td>
</tr>
<tr>
<td>Instructions</td>
<td>Only appears when Task value from is set to Fields</td>
</tr>
<tr>
<td>Template</td>
<td>Only appears when Task value from is set to Template.</td>
</tr>
<tr>
<td>SetValues</td>
<td>Only appears when Task value from is set to Values.</td>
</tr>
<tr>
<td>Advanced</td>
<td>Check Advanced if you want to use a script to assign values on the catalog task. When you check Advanced, a text box appears where you can enter your script.</td>
</tr>
</tbody>
</table>
### Advanced Script

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced Script</td>
<td>Only appears when the Advanced field is checked. Set additional values for the task in this script. This script is run after the task values are set using the Fields, Template or Values you have specified. Use the variable task when setting additional values, for example: task.short_description = current.short_description;</td>
</tr>
</tbody>
</table>

### Catalog Task Variables

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables on Task Form</td>
<td>Specify optional catalog variables to include on the Catalog task form. The variables you select here will be displayed in a field called Variable Editor. If you select no variables here, the Variable Editor field in the Catalog Task form will not be visible.</td>
</tr>
</tbody>
</table>

### Catalog Task Schedule

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Due date based on</td>
<td>Select how workflow determines the task's duration, due date, and schedule. • A user specified duration: The duration is based on a user specified value. • A relative duration: The duration is calculated from a relative duration (such as End of Next Business Day). • A date/time or duration field: The duration is based on the value of a field on the current record. • Script: The duration is returned by a script.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>Only appears when Due date based on is set to A user specified duration The specific number of days and hours.</td>
</tr>
<tr>
<td>Relative duration</td>
<td>Only appears when Due date based on is set to A relative duration The general number and length of business days.</td>
</tr>
<tr>
<td>Due date field</td>
<td>Only appears when Due date based on is set to A date/time or duration field The date/time or duration field.</td>
</tr>
<tr>
<td>Due date script</td>
<td>Only appears when Due date based on is set to Script The script that sets 'answer' to the number of seconds for the duration.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Schedule based on             | The basic schedule the timer uses to count working hours. If a schedule is specified, the duration will only be considered for times that are specified on the schedule. For example, if the duration is 2 hours and the workflow begins at 4:00pm on a schedule that is 8am - 5pm, then it ends at 9:00am the next day. The options are:  
  • This workflow's schedule: The schedule uses workflow context date, time, and an optional Time zone based on value.  
  • A specific schedule: The schedule uses a pre-defined Schedule and an optional Time zone based on value.  
  • A schedule field: The schedule uses a value from a table and an optional Time zone based on value. |
| Schedule                      | The predefined Schedule from a list.                                                                                                           |
| Schedule field                | A date and time or duration field for the schedule, that is associated with the table. Valid fields appear in blue on the Select the element from a tree dialog. |
| Time zone based on            | The time zone for calculating the duration. The time zone may be based on:  
  • No time zone: Default. Workflow uses the GMT time zone.  
  • A specific time zone: A specific Time zone that you choose from a choice list.  
  • A time zone field: A Time zone field to track time duration from a field on the form. |
| Time zone                     | Select the time zone you want from the choice list.                                                                                           |
| Time zone field               | A date and time or duration field for the schedule, that is associated with the table. Valid fields appear in blue on the Select the element from a tree dialog. |

**States**

The activity state tells the workflow engine what to do with the activity.
Table 1332: Catalog Task activity states

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executing</td>
<td>The workflow engine knows to start the onExecute function of the activity.</td>
</tr>
<tr>
<td>Waiting</td>
<td>The workflow engine ignores the activity until a specific event to restart the activity is fired.</td>
</tr>
<tr>
<td>Finished</td>
<td>The activity finished running. See the result value for the outcome of the activity.</td>
</tr>
<tr>
<td>Cancelled</td>
<td>This activity, or the workflow that contains this activity, was canceled.</td>
</tr>
<tr>
<td>Error</td>
<td>A JavaScript error occurred. Review the logs for error details.</td>
</tr>
</tbody>
</table>

Create Task workflow activity

The Create Task activity generates a record on any of the tables that extend Task [task].

**Note:** This activity is only available when the workflow runs on a table that extends Task.

If the Wait for completion check box is selected, the workflow context waits for a user action on the task, such as Complete or Incomplete, and then progresses based on the user action.

Results

You can assign a result value using activity.result from within a script field of the activity. By default, the final State value of the task record determines the result value for the Create Task activity. Possible result values are:

- Closed complete
- Closed incomplete
- Closed skipped
- Deleted
- Cancelled

Input variables

The following variables determine the behavior of the activity.

Table 1333: Create Task activity input variables

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create Task Activity Settings</td>
<td>The following fields specify the behavior of the Create Task Activity.</td>
</tr>
<tr>
<td>Task type</td>
<td>The type of task to create. Select from the corresponding task table for the workflow.</td>
</tr>
<tr>
<td>Priority</td>
<td>The priority that is assigned to the task.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Wait for completion</td>
<td>If selected, the workflow activity waits for the task to complete before continuing. If cleared, the task is created but the workflow proceeds.</td>
</tr>
<tr>
<td>Create Task Record Settings</td>
<td>The following fields specify the field values that this activity sets for the task it creates.</td>
</tr>
<tr>
<td>Task values from</td>
<td>The values used to create the task may either come from:</td>
</tr>
<tr>
<td></td>
<td>• Fields: a predefined set of fields including Fulfillment group, Assigned to, Short description and Instructions.</td>
</tr>
<tr>
<td></td>
<td>• Template: an existing template for the selected task table.</td>
</tr>
<tr>
<td></td>
<td>• Values: values that you specify using a Set Values widget.</td>
</tr>
<tr>
<td>Fulfillment group</td>
<td>The group that is responsible for completing the task. Populates the Assignment group field on the new task.</td>
</tr>
<tr>
<td>Only appears when Task value from is set to Fields</td>
<td></td>
</tr>
<tr>
<td>Assigned to</td>
<td>The user who is responsible for completing the task. Populates the Assignment to field on the new task.</td>
</tr>
<tr>
<td>Only appears when Task value from is set to Fields</td>
<td></td>
</tr>
<tr>
<td>Short description</td>
<td>A short description for the task. Populates the Short description field on the new task.</td>
</tr>
<tr>
<td>Only appears when Task value from is set to Fields</td>
<td></td>
</tr>
<tr>
<td>Instructions</td>
<td>The task instructions for the user to complete prior to closing the task. Populates the Description field on the new task.</td>
</tr>
<tr>
<td>Only appears when Task value from is set to Fields</td>
<td></td>
</tr>
<tr>
<td>Task template</td>
<td>A template that is used to fill in values for the task.</td>
</tr>
<tr>
<td>Only appears when Task values from is set to Template.</td>
<td></td>
</tr>
<tr>
<td>Set values</td>
<td>A widget that is used to specify values for any fields of the task.</td>
</tr>
<tr>
<td>Only appears when Task values from is set to Values.</td>
<td></td>
</tr>
<tr>
<td>Advanced</td>
<td>Check Advanced if you want to use a script to assign values on the catalog task. When you check Advanced, a text box appears where you can enter your script.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Advanced Script</td>
<td>Set additional values for the task in this script. This script is run after the task values are set using the Fields, Template or Values you have specified. Use the variable task when setting additional values, for example: task.short_description = current.short_description;</td>
</tr>
<tr>
<td>Task Schedule</td>
<td><strong>Due date based on</strong>  Select how workflow determines the task's duration, due date, and schedule.</td>
</tr>
<tr>
<td></td>
<td>• A user specified duration: The duration is based on a user specified value.</td>
</tr>
<tr>
<td></td>
<td>• A relative duration: The duration is calculated from a relative duration (such as End of Next Business Day).</td>
</tr>
<tr>
<td></td>
<td>• A date/time or duration field: The duration is based on the value of a field on the current record.</td>
</tr>
<tr>
<td></td>
<td>• Script: The duration is returned by a script.</td>
</tr>
<tr>
<td>Duration</td>
<td>The specific number of days and hours.</td>
</tr>
<tr>
<td>Relative duration</td>
<td>The general number and length of business days.</td>
</tr>
<tr>
<td>Due date field</td>
<td>The date/time or duration field.</td>
</tr>
<tr>
<td>Due date script</td>
<td>The script that sets 'answer' to the number of seconds for the duration.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Schedule based on             | The basic schedule the timer uses to count working hours. If a schedule is specified, the duration will only be considered for times that are specified on the schedule. For example, if the duration is 2 hours and the workflow begins at 4:00pm on a schedule that is 8am - 5pm, then it ends at 9:00am the next day. The options are:  
  • This workflow's schedule: The schedule uses workflow context date, time, and an optional Time zone based on value.  
  • A specific schedule: The schedule uses a pre-defined Schedule and an optional Time zone based on value.  
  • A schedule field: The schedule uses a value from a table and an optional Time zone based on value. |
| Schedule                      | The predefined Schedule from a list.                                                                                                        |
| Schedule field                | A date and time or duration field for the schedule, that is associated with the table. Valid fields appear in blue on the Select the element from a tree dialog. |
| Time zone based on            | The time zone for calculating the duration. The time zone may be based on:  
  • No time zone: Default. Workflow uses the GMT time zone.  
  • A specific time zone: A specific Time zone that you choose from a choice list.  
  • A time zone field: A Time zone field to track time duration from a field on the form. |
| Time zone                     | Select the time zone you want from the choice list.                                                                                         |
| Time zone field               | A date and time or duration field for the schedule, that is associated with the table. Valid fields appear in blue on the Select the element from a tree dialog. |

**States**

The activity state tells the workflow engine what to do with the activity.
Table 1334: Create Task activity states

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executing</td>
<td>The workflow engine knows to start the onExecute function of the activity.</td>
</tr>
<tr>
<td>Waiting</td>
<td>The workflow engine ignores the activity until a specific event to restart the activity is fired.</td>
</tr>
<tr>
<td>Finished</td>
<td>The activity finished running. See the result value for the outcome of the activity.</td>
</tr>
<tr>
<td>Cancelled</td>
<td>This activity, or the workflow that contains this activity, was canceled.</td>
</tr>
<tr>
<td>Error</td>
<td>A JavaScript error occurred. Review the logs for error details.</td>
</tr>
</tbody>
</table>

Utility workflow activities

Utility activities provide controls over the path of the workflow, and other useful tools.

*Branch workflow activity*

The Branch activity splits the workflow into multiple transition paths from a single activity.

To add a transition path, drag the Branch activity onto the canvas. When the Branch activity properties form displays, click Submit to add the activity to the canvas. Once the activity is on the canvas, right click in the activity body, then click Add Condition.

All transitions from this activity execute concurrently. This activity provides a single Always condition. You can draw any number of transitions from this condition. Using this activity is equivalent to drawing multiple transitions from a single condition of another activity.

Branching can affect the behavior of rollback activities. See *Rollback To activity* on page 3466 for more information.

*Join workflow activity*

The Join activity unites multiple execution paths into one transition.

Use this activity to cause a workflow to wait for all activities in multiple paths to finish before continuing. If multiple concurrent workflow paths meet without a Join activity, any subsequent activities execute twice.

To add Join to the canvas, click Submit. On the canvas, connect incoming transitions from each activity you want to act as a predecessor to the Join activity. Then connect outgoing transitions to the two exit conditions: Complete and Incomplete.

Results

Provide an Incomplete transition out of a Join whenever it is possible for any predecessor activities to follow a transition path that does not lead to the Join activity.

Table 1335: Join activity results

<table>
<thead>
<tr>
<th>Result</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete</td>
<td>Join exits along the Complete path when the system has determined that all predecessor activities have completed and transitioned to the Join.</td>
</tr>
<tr>
<td>Result</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Incomplete</td>
<td>Join exits along the Incomplete path when the system determines that at least one predecessor activity completed but transitioned along a path that bypassed the Join activity.</td>
</tr>
</tbody>
</table>

**Lock workflow activity**

The Lock activity prevents other instances of this workflow from continuing past this activity until the lock is released.

Several instances of the same workflow may run concurrently. For example, if a workflow is triggered when a record is added to a particular table and multiple records are added one after the other, that workflow will be triggered multiple times: once by each record insertion. In such cases, you can use the lock activity to ensure that this instance of the workflow has completely finished one or more activities before any other instance of the workflow can proceed.

A workflow can explicitly release a lock with the Unlock activity. The lock may also be released when the Max duration is reached.

When an instance of the workflow reaches the Lock activity, it attempts to obtain a lock using the key specified in the lock activity. If another instance has already obtained the lock and has not yet released it, this lock attempt fails. The instance continues trying to obtain the lock until Max attempts has been reached.

**Note:**

We recommend placing a one-second timer activity before the lock activity. This helps prevent a rare condition in which the lock activity may not be able to distinguish one workflow instance from another. This condition can occur because the entity owning the lock is not the specific workflow instance, but rather the code-execution thread in which that instance is running. In most cases, each workflow instance runs on a different thread, but adding a timer activity ensures that this is the case.
Figure 769: Example of Lock Activity Preceded by Timer Activity

Since a Lock activity can only temporarily prevent processing of other workflow instances, do not add activities that cause the workflow to wait between a Lock and Unlock activity block. This may cause the
Unlock activity to be unable to acquire the lock to release it and instead take 60 seconds to complete. Restricted wait activities include:

- Approval activities
- Task activities
- Timer activities
- Wait for condition activity
- Wait for WF Event activity

Results

Table 1336: Lock activity results

<table>
<thead>
<tr>
<th>Result</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The activity successfully obtained a lock. This instance of the workflow can proceed past this point, but other instances cannot until the lock is released.</td>
</tr>
<tr>
<td>Failure</td>
<td>After attempting to obtain the lock Max attempts times, the activity could not obtain the lock.</td>
</tr>
</tbody>
</table>

Input variables

Input variables determine the initial behavior of the activity.

Table 1337: Lock activity input variables

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key</td>
<td>A unique mutex key. The Unlock activity activity uses this key to release the lock.</td>
</tr>
<tr>
<td>Duration</td>
<td>The maximum time the lock persists. The lock is released after it reaches this duration. Releasing a lock this way is equivalent to running the Unlock activity.</td>
</tr>
<tr>
<td>Max. duration</td>
<td>Specify how the activity behaves if the lock attempt is denied. If the final lock attempt fails, the activity state will be set to 'timeout' and the activity result will be set to 'failed'.</td>
</tr>
<tr>
<td>Lock attempts</td>
<td>Specify the maximum number of times the activity may attempt to obtain the lock.</td>
</tr>
<tr>
<td>Delay between attempts</td>
<td>The amount of time required after a failed lock attempt before another lock attempt is allowed.</td>
</tr>
</tbody>
</table>
States

The activity state tells the workflow engine what to do with the activity.

Table 1338: Lock activity states

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waiting</td>
<td>The workflow engine is waiting to obtain a lock.</td>
</tr>
<tr>
<td>Finished</td>
<td>The activity successfully obtained the lock.</td>
</tr>
<tr>
<td>Timeout</td>
<td>The activity could not obtain a lock within the number of attempts specified by the Max. attempts input variable.</td>
</tr>
</tbody>
</table>

Log Message workflow activity

The Log Message activity writes a message to the workflow log.

Use this activity to add entries to the workflow's log for debugging or tracing purposes.

Input variables

Input variables determine the initial behavior of the activity.

Table 1339: Log Message activity input variables

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message</td>
<td>The message to log. This variable can be a string or a JavaScript expression that evaluates to a string.</td>
</tr>
</tbody>
</table>

Log Trace Message workflow activity

The Log Trace Message activity writes a trace message to the workflow log.

The trace message includes the activity name, the event that invoked the workflow, and the table of the current record. There are no variables or conditions. To log other data, use the Log Message workflow activity on page 3436 activity.

REST Message legacy workflow activity

The legacy REST Message activity enables an administrator to override the REST endpoint or supply the variables configured in the REST Message module.

This activity is deprecated in the London release and no longer shows up in the Workflow canvas for new workflow development. New workflows should use the Orchestration REST Activity templates instead.

Existing workflows using it will continue to work as designed. To edit this activity in an existing workflow, you must re-activate the activity.

The REST Message activity executes a dead link REST function (POST, PUT, GET, or DELETE) on an endpoint using values defined in the function record.

Note: If you want to use a MID Server to send the REST message, the MID Server must be accessible by the instance and configured to use SSH.
### Input variables

**Table 1340: REST Message activity input variables**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rest Message</td>
<td>Name of the REST message to run. This is a reference field to the REST Message [sys_rest_message] table (System Web Services Outbound REST Message).</td>
</tr>
<tr>
<td>REST Message Function</td>
<td>Function to call that is defined in a REST message function. This is a reference field to the HTTP Method [sys_rest_message_fn] table (System Web Services Outbound REST Message). Available functions are put, post, get, or delete. You can edit functions in the HTTP Methods related list in each REST Message record.</td>
</tr>
<tr>
<td>REST Endpoint</td>
<td>REST endpoint to use instead of the Endpoint defined in the HTTP Method record. Leave this field blank to use the defined endpoint in the REST Message Function record.</td>
</tr>
<tr>
<td>Rest Message Variables</td>
<td>Values to use for variables defined in the HTTP Method record. Use the following format for the string: name1=value1, name2=value2, ... For example, use name=${nameValue}, id=${idValue} where name and id are function variables. If either the variable name or value contains a comma or equal sign, escape those characters with a backslash.</td>
</tr>
<tr>
<td>Use MID Server</td>
<td>Check this box if you want to use a MID Server to send the REST message. A MID Server might be necessary to reach an endpoint within a firewall or a subnet that is not visible from the instance. If this check box is selected, but no MID Server is defined in the MID Server field, the workflow automatically attempts to find a MID Server based on IP range and the REST capability.</td>
</tr>
<tr>
<td>MID Server</td>
<td>Name of the MID Server to use. This field is available when Use MID Server is selected. The workflow ignores this parameter if the use_midserver parameter is disabled.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Rest Message Script</td>
<td>The script to execute after the request has been made and a response has been received. You can access the full response body from the activity.output variable.</td>
</tr>
<tr>
<td>Sensor Script</td>
<td>The script to execute after the request has been made and a response has been received. You can access the full response body from the activity.output variable.</td>
</tr>
</tbody>
</table>

**Return Value workflow activity**

The Return Value activity returns a value to a parent workflow, when run from a subflow.

This activity has no variables or conditions. For more information, see *Workflows used as subflows* on page 3240.

Use this activity within a subflow to store data that the parent flow can access. The Return Value activity adds the data from the subflow's value variable to the parent workflow's scratchpad.

**Scratchpad entries**

The activity uses the workflow scratchpad to read and write persistent values.

**Table 1341: Return Value activity scratchpad entries**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>value</td>
<td>The activity writes the value from the subflow value variable to the parent scratchpad. The parent workflow activity that runs the subflow includes a Map return value to variable that defines where the parent workflow stores the returned data. This data can be scalar, a stringifiable JavaScript object, or an expression that evaluates to a stringifiable JavaScript object.</td>
</tr>
</tbody>
</table>

**Run Script workflow activity**

The Run Script activity runs the specified script in the scope of the workflow version.

**Note:** All changes to current are automatically updated. There is no need to call current.update()

**Input variables**

Input variables determine the initial behavior of the activity.

**Table 1342: Run Script activity input variables**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Script</td>
<td>Script to execute.</td>
</tr>
</tbody>
</table>

**Set Values workflow activity**

The Set Values activity sets values on the current record when the workflow quiesces or ends.
**Input Fields**

The values you enter in the following fields determine the behavior of the activity.

**Table 1343: Set Values Activity Input Fields**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set these values</td>
<td>From the list on the left, select the field on the current record whose value you want to set when the workflow quiesces or ends. In the user-input field to the right, select or enter the value to which you want that field set.</td>
</tr>
</tbody>
</table>

*Note*: Avoid setting the same fields from different Set Value activities. The workflow only sets the value specified by the last Set Values activity run before quiescing or ending.

*Note*: Using the Set Values activity to set the Approval field on a task does not cancel pending approvals. To approve a task in a workflow, use the **Approval Action** activity instead.

**SOAP Message legacy workflow activity**

The legacy SOAP Message activity uses SOAP messages defined in the System Web Services plugin and can call the messages using a MID Server.

This activity is deprecated in the London release and no longer shows up in the Workflow canvas for new workflow development. New workflows should use the **Orchestration** SOAP Activity templates instead.

Existing workflows using it will continue to work as designed. To edit this activity in an existing workflow, you must **re-activate the activity**.

**Input variables**

**Table 1344: SOAP Message activity input variables**

<table>
<thead>
<tr>
<th>Field</th>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOAP Message</td>
<td>soap_message</td>
<td>The SOAP Message defined under the System Web Services plugin's Outbound SOAP Message [sys_soap_message] table. ( System Web Services Outbound SOAP Message )</td>
</tr>
<tr>
<td>SOAP Message Function</td>
<td>soap_message_function</td>
<td>The function to call that is defined in the SOAP Message. Functions are listed in the SOAP Message Functions related list in each SOAP Message record.</td>
</tr>
<tr>
<td>Field</td>
<td>Parameter</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>SOAP Endpoint</td>
<td>soap_endpoint</td>
<td>Endpoint to use instead of the SOAP endpoint value in the SOAP Message Function record. Leave this field blank to use the defined endpoint in the SOAP Message Function record.</td>
</tr>
<tr>
<td>Variables</td>
<td>variables</td>
<td>Variables to substitute into the SOAP Envelope defined in the SOAP Message Function record. Use this format for the string: name1=value1, name2=value2, . . . If either the name or value contains a comma or equal sign, escape these characters with a backslash.</td>
</tr>
<tr>
<td>Use MID Server</td>
<td>use_midserver</td>
<td>Check box for using a MID Server to send the SOAP message. A MID Server might be necessary to reach an endpoint within a firewall or a sub-network that is not visible from the instance. If this check box is selected (true), but no MID Server is defined in the MID Server field, Workflow automatically attempts to find a MID Server.</td>
</tr>
<tr>
<td>MID Server</td>
<td>midserver</td>
<td>Name of the MID Server to use. This field appears when you select the Use MID Server check box. The workflow ignores this parameter if the use_midserver parameter is disabled.</td>
</tr>
<tr>
<td>Sensor Script</td>
<td>sensor_script</td>
<td>The script to execute after the request has been made and a response has been received. You can access the full XML response body from the activity.output object.</td>
</tr>
</tbody>
</table>

*Turnstile workflow activity*

The Turnstile activity limits how many times a workflow can pass through the same point.

Use this activity to prevent infinite loops. This activity is useful alongside the *Rollback To workflow activity* on page 3394 activity.
Results

You can assign a result value using the activity.result variable from within a script field of the activity. By default, the activity script evaluates if the activity should continue to iterate or stop.

Table 1345: Turnstile activity results

<table>
<thead>
<tr>
<th>Result</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continue</td>
<td>The Allowed iterations value is greater than the number of times the workflow accessed this activity.</td>
</tr>
<tr>
<td>Cancel</td>
<td>The workflow accessed this activity more times than the Allowed iterations value.</td>
</tr>
</tbody>
</table>

Input variables

Input variables determine the initial behavior of the activity.

Table 1346: Turnstile activity input variables

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allowed iterations</td>
<td>Number of times the workflow can pass through this activity before the turnstile ends the loop.</td>
</tr>
</tbody>
</table>

Conditions

The conditions determine which transition comes after this activity.

Table 1347: Turnstile activity conditions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continue</td>
<td>If the workflow has returned to this point an amount of times less than the allowed iteration.</td>
</tr>
<tr>
<td>Cancel</td>
<td>If the workflow has returned to this point an amount of times more than the allowed iteration.</td>
</tr>
</tbody>
</table>

States

The activity state tells the workflow engine what to do with the activity.
Table 1348: Turnstile activity states

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executing</td>
<td>The workflow engine knows to start the onExecute function of the activity.</td>
</tr>
<tr>
<td>Waiting</td>
<td>The workflow engine ignores the activity until a specific event to restart the activity is triggered.</td>
</tr>
<tr>
<td>Finished</td>
<td>The activity finished running. See the result value for the outcome of the activity.</td>
</tr>
<tr>
<td>Cancelled</td>
<td>This activity, or the workflow that contains this activity, was canceled.</td>
</tr>
<tr>
<td>Error</td>
<td>A JavaScript error occurred. Review the logs for error details.</td>
</tr>
</tbody>
</table>

Unlock workflow activity

The Unlock activity releases a lock that was previously placed by the Lock activity.

To release a lock, specify the same lock key that was specified in the Lock activity. If the Lock activity had a Duration specified, and that duration has already passed, the lock will already be released.

Input variables

Input variables determine the initial behavior of the activity.

Table 1349: Unlock activity input variables

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lock key</td>
<td>The Mutex key that releases the lock. This key must match the key specified by a Lock activity. For more information, see Lock activity.</td>
</tr>
</tbody>
</table>

States

The activity state tells the workflow engine what to do with the activity.

Table 1350: Unlock activity states

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finished</td>
<td>The activity successfully released the lock.</td>
</tr>
</tbody>
</table>

Subflow activities in workflow

Subflow activities run and manage workflows from a parent workflow.

The Parallel Flow Launcher subflow activity is available.

Parallel Flow Launcher workflow activity

The Parallel Flow Launcher activity launches multiple subflows in parallel.
Workflows running in parallel execute simultaneously and may complete in any order. The activity can launch a single subflow or multiple subflows as needed. You can manage the input values and values returned for each subflow.

**Note:** The Parallel Flow Launcher activity waits until all subflows are completed before proceeding. If any subflow does not finish, the activity waits indefinitely.

**Note:** Do not launch a large number of subflows with the Parallel Flow Launcher activity. If overused, this activity can overburden the instance. For launching very large numbers of subflows, consider putting the Parallel Flow Launcher inside a loop controlled by a turnstile or other conditional activity and having it do batches of no more than 500 at a time.

### Activity variables

Activity variables determine the initial behavior of the activity.

#### Table 1351: Parallel Flow Launcher activity input variables

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parallel Flow Launcher configuration</td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>A unique name for the activity.</td>
</tr>
<tr>
<td>Stage</td>
<td>The stage to display when the workflow reaches the activity.</td>
</tr>
<tr>
<td>Inputs</td>
<td>Inputs to the subflows to run. Specify an array of name: value pairs for each input defined in the workflow being launched. The name and data type of each input variable entered must match those used by the subflow that this activity launches. For a detailed example, see <a href="#">Parallel Flow Launcher Example</a>.</td>
</tr>
<tr>
<td>Parallel Flow Launcher selection</td>
<td></td>
</tr>
<tr>
<td>Workflow</td>
<td>The workflow to run.</td>
</tr>
<tr>
<td>Advanced</td>
<td>Check Advanced, to enter a script that uses a WorkflowCoordinator object to manage the subflows. When you check Advanced, a text box appears where you can enter a script that specifies a unique workflow for each set of input variables. See <a href="#">WorkflowCoordinator object</a> on page 3445 for more information.</td>
</tr>
<tr>
<td>Parallel Flow Launcher iteration</td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>If not specified by an input set, Count determines the number of subflows executed in parallel from this activity. If the Advanced option is not selected, ensure that this field is populated with a valid number.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Max flows</td>
<td>The maximum number of workflows this activity can launch. If this value is a positive integer, it overrides the max parameter used in the WorkflowCoordinator constructor.</td>
</tr>
<tr>
<td>Max simultaneous</td>
<td>The maximum number of parallel workflows this activity can run at one time. If this value is a positive integer, it overrides the poolsize parameter used in the WorkflowCoordinator constructor.</td>
</tr>
</tbody>
</table>

**Parallel Flow Launcher Process**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process flow complete</td>
<td>To specify a script that runs after each subflow completes, check Process flow complete. If you check this field, a text box labelled Flow complete appears, where you can enter the script to run.</td>
</tr>
<tr>
<td>Flow complete</td>
<td>The script that runs each time a subflow finishes. This field is available when the Process flow complete option is selected.</td>
</tr>
</tbody>
</table>

The same script functions and variables available in other workflow scripts, such as those in the Run Script activity, are available here. For more information, see Completed subflow values in scripts on page 3446.

The variable "flow" is available to this script. It is an object that contains the following information about the flow that is finishing:

- flow.output (String): The value that the subflow returns to the parent if it executed a Return Value activity before ending.
- flow.index (Number): The zero-relative index of the subflow that finished.
- flow.contextId (String): The sys_id of the workflow context for the completed subflow.
- flow.inputs (Object): The inputs that were passed to the subflow when its context was created and started.
- flow.status (String): The final state of the context. This corresponds to the state column in the subflow context record, which has possible values of executing, finished, cancelled, or faulted. (Since the flow is completed, it cannot be executing at this point.)
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
</table>
| Process finished    | To specify a script that runs after all subflows have finished, check Process finished. If you check this field, a text box labelled Finished Script appears where you can enter the script to run. The ‘coordinator’ variable is made available to this script and is an object that allows access to any of the finished subflows using the getFlow(index) method. For example:  
for (var i = 0; i < coordinator.getNumFlows(); i++)  
writeFlowResultsToTable( i, coordinator.getFlow(i) ); |
| Finished script     | The script that runs after all subflows launched by the activity are complete. You can use variables that contain completed flow information in this script. 

The ‘coordinator’ variable is made available to this script and is an object that allows access to any of the finished subflows using the getFlow(index) method. For example:  
for (var i = 0; i < coordinator.getNumFlows(); i++)  
writeFlowResultsToTable( i, coordinator.getFlow(i) );  
This field is available when Process finished is selected. |

**States**

The activity state tells the workflow engine what to do with the activity. To view an activity’s state, point to the activity. A pop-up window shows the State and Result of the activity. If the activity is in an error state, the pop-up window provides a brief Fault Description.

**Table 1352: Parallel Flow Launcher activity states**

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waiting</td>
<td>The activity is waiting for all subflows to finish. All subflows have started and some may have finished.</td>
</tr>
<tr>
<td>Finished</td>
<td>The activity successfully completed all of the subflows.</td>
</tr>
<tr>
<td>Error</td>
<td>The activity encountered an error.</td>
</tr>
</tbody>
</table>

**WorkflowCoordinator object**

A WorkflowCoordinator object specifies which subflows to run and the input variables to pass to those subflows.

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When using a WorkflowCoordinator object, you can create a Parallel Flow Launcher activity that launches multiple subflows. When using the activity without a WorkflowCoordinator object, you can only launch a single subflow multiple times. Use one of the following methods to specify a WorkflowCoordinator object for the activity when the Advanced activity input variable is selected.

- Reference a workflow scratchpad variable that contains an existing WorkflowCoordinator object. To save a WorkflowCoordinator object to the scratchpad, call the save(variableName) function on the WorkflowCoordinator object. You can reference the object using the value passed in the variableName parameter. For example, you can create a WorkflowCoordinator object in a Run Script activity, save the object using <object>.save('coord'), and then call this object by entering coord in the Workflow activity variable of a subsequent Parallel Flow Launcher activity.
- Define the WorkflowCoordinator within the Workflow activity variable. Add the javascript: identifier at the beginning of the script. The Parallel Flow Launcher example on page 3447 shows how to use a WorkflowCoordinator object in this way.
- Create a factory class to define the WorkflowCoordinator object. The system does not provide a factory class for WorkflowCoordinator by default.

Completed subflow values in scripts
The Parallel Flow Launcher activity exposes additional variables you can use in scripts.

Table 1353: Additional variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>coordinator</td>
<td>The WorkflowCoordinator used when running the subflows. You can use this variable in the Finished script to perform any final operations. Additionally, you can use the WorkflowCoordinator in a later workflow activity by passing the activity name or sys_id to the WorkflowCoordinator.load('&lt;Activity&gt;') function. For example, to load the WorkflowCoordinator object from a Parallel Flow Launcher activity called Launch Subflows, enter var coord = WorkflowCoordinator.load('Launch Subflows'); in a later activity.</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
</tr>
<tr>
<td>flow</td>
<td>The subflow launched by the activity that completed most recently. You can use this variable in the Flow complete script to perform any post-processing operations on each subflow. To get a complete subflow from a coordinator object, use <code>var flow = coord.getFlow(I);</code> where <code>I</code> is the numeric index of the subflow based on the order it was launched. These values are available from the completed subflow:</td>
</tr>
<tr>
<td></td>
<td>• index: the numerical index of this subflow based on the order it was launched</td>
</tr>
<tr>
<td></td>
<td>• workflow: the sys_id or name, depending on which you passed to the WorkflowCoordinator constructor, of the workflow used for this subflow</td>
</tr>
<tr>
<td></td>
<td>• inputs: any input values provided to the launched subflow</td>
</tr>
<tr>
<td></td>
<td>• status: status of the subflow context</td>
</tr>
<tr>
<td></td>
<td>• output: the value returned by the subflow</td>
</tr>
<tr>
<td></td>
<td>• contextId: the sys_id of the workflow context for the subflow</td>
</tr>
</tbody>
</table>

Parallel Flow Launcher example

This example shows how to use the Parallel Flow Launcher activity with an array of input values and with a WorkflowCoordinator object.

Sample workflow

This example shows a SQL-based web server with four application nodes. A single subflow runs to provision the database, and multiple parallel subflows each configure an application node. Finally, a separate set of parallel subflows configures the nodes to use a load balancer and sets up the server DNS.

![Diagram of sample workflow](image)

Figure 770: Parallel flow launcher business case
Provision the application nodes

The first Parallel Flow Launcher activity launches the Provision Node subflow four times. The activity passes a unique IP address to each subflow from an array in the Inputs variable. The scripts defined in the Flow complete and Finished script variables write log messages regarding the status of the subflows.
Activity Properties: Parallel Flow Launcher

Name: Provision application nodes

Stage:

Inputs:

- [u_host: '192.168.0.10'],
- [u_host: '192.168.0.20'],
- [u_host: '192.168.0.30'],

Advanced:

Workflow: Provision Node

Count:

Max flows: 25

Max simultaneous: 5

Process flow complete:

Flow complete:

```javascript
// To access the flow that completed, use the 'flow' variable.

var flowOutput = flow.output;

workflow.debug("Provision Node Finished. Context: \" + flow.contextId);
```

Process finished:

Finished script:

```javascript
// To access the set of completed workflows use the 'coordinator' variable.

var flowResult = coordinator.getFlow(1).output;

workflow.debug("All Nodes Provisioned");
```
Add nodes to the load balancer

The second Parallel Flow Launcher activity uses WorkflowCoordinator objects to specify which subflows to run. The coordinator variable stores the completed flow information from the previous Provision Nodes activity. The script then retrieves the IP address and port for each node that was provisioned. The coord2 WorkflowCoordinator object runs the Add Node to Load Balancer subflow once for each node, using the retrieved IP address and port information as input variables. Finally, the coord2 WorkflowCoordinator object runs the SetupDNS subflow once to configure the load balancer.

```
javascript:
var coordinator = WorkflowCoordinator.load("Provision Nodes");
var coord2 = new WorkflowCoordinator(
  workflow: 'Add Node to Load Balancer'
);
for (var i = 0; i < coordinator.getNumFlows(); i++) {
  var ip = coordinator.getInput(i).ip;
  var port = coordinator.getOutput(i);
  coord2.add(
    ip: ip,
    port: port
  );
}
var loadBalancerIP = "10.0.20.10";
coord2.add( {ip: loadBalancerIP, hostname: 'www.snow1.net', 'SetupDNS'});
coord2;
```

Figure 772: Specifying which subflows to run

Workflows used as subflows
A workflow can launch another workflow as an activity.

The parent workflow triggers the subflow and then waits for the subflow to complete before continuing. Run the workflow validation tool prior to publishing to detect missing subflows and other dependency problems, such as those involving update sets.

The Workflows tab in the Workflow Editor contains a list of the workflows available for use as subflows.
Figure 773: Workflows available to use as subflows

Make sure that the selected subflow is active. If the subflow is inactive, the main workflow will hang with a Loading message. If you place an inactive subflow into a workflow, the subflow appears with a red banner, indicating that it cannot run. An active subflow is highlighted in blue when selected.
Figure 774: Workflow with active subflows

**Subflows and the Create Task activity**

If a workflow contains a *Create Task* activity that has executed on the current record, additional task activities in the workflow might not execute as expected.

This can happen when the same subflow containing a Create Task activity runs more than once in a parent flow. When the subflow reruns and attempts to execute the Create Task activity again, the system reopens the first task activity instead and does not create an additional task.

**Note:** An alternative to creating duplicate subflows that use the Create Task activity is to add a *Run Script* activity to the workflow that creates a task with a script.
Figure 775: The same create task activity runs twice in a workflow

In this configuration, the workflow does not run the same subflow containing a Create Task activity more than once. This allows the workflow to create additional tasks.
Figure 776: Running different subflows containing the Create Task activity

View workflow activity descriptions

Tooltips are available for workflow activities to help you understand how to use each activity.

1. To view an activity description in the Workflow Editor, point to the icon for the activity in the palette.
2. To modify activity descriptions, navigate to Workflow Administration Activity Definitions and edit the Description field.

**Note:** To view more information about an activity, double-click the activity on the canvas and then click the help icon in the title bar of the Activity Properties window.

**Elements in workflow activity definitions**

Each activity can specify a number of elements that control the behavior of the activity or are controlled by the activity.

Not all activities specify all possible elements. See *Workflow activities* on page 3367 for links to the activities provided by default. Each activity description includes a detailed explanation of the specific elements offered by that activity.
Table 1354: Workflow activity elements

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Results</td>
<td>The possible activity.results value. The activity result usually determines which condition the activity transitions through.</td>
</tr>
<tr>
<td>Scratchpad entries</td>
<td>Scratchpad variables the activity depends on to run, or variables the activity writes to the scratchpad.</td>
</tr>
<tr>
<td>Input variables</td>
<td>Values that control the behavior of the activity. Fields to set these values appear on the Activity Properties form when a new activity is added to a workflow. See Activity variables on page 3250 for more information.</td>
</tr>
<tr>
<td>Conditions</td>
<td>Determines which transition the activity follows after completing. See Manage workflow activity conditions on page 3461 for more information.</td>
</tr>
<tr>
<td>States</td>
<td>Determines how the workflow handles the record being executed.</td>
</tr>
</tbody>
</table>

Add an activity to a workflow

Available activities are displayed in the Core, Packs, and Custom tabs in the Workflow Editor palette.

1. In the Workflow Editor, check out a workflow.
2. To add a workflow activity, drag it from the Core, Packs, or Custom tab to the canvas and drop it on a transition line in the workflow body.

   The transition turns blue when it is connected to the new activity. The designer adds the activity to the flow at that point and displays the property form for the new activity.

   If an activity is greyed out, approval engines are enabled for the table on which the workflow runs. To use the activity, turn approval engines off for the table.
3. Create any additional conditions needed for the activity and ensure that all exits are connected.
4. Run the workflow validation tool prior to publishing to detect missing or disconnected transitions that can cause a workflow to hang.

**Note:** All activity descriptions have a Table value. If this value is Global, the activity is available for use with any workflow regardless of the table selected in the workflow properties. Activities that identify a specific table appear in the palette only if the table configured for the workflow matches or extends the table identified in the activity.
Duplicate a workflow activity

You can duplicate an activity used in a workflow, including all the configured properties.

1. Right-click the activity and select Copy Activity from the context menu.
   The system automatically duplicates the activity, but does not create transitions.
2. Double-click the copy and configure the properties appropriately.
3. Drag the activity to a location in the workflow.
4. Add transitions.
Manage transitions between workflow activities

Transitions define the processing path of the workflow, depending on conditions defined in each activity. All conditions in an activity must have a transition and all transitions must have a connection to another activity or to the End activity.

**Note:**

Run the *workflow validation* tool prior to publishing to detect missing or disconnected transitions that could cause a workflow to hang.

1. Add transitions to the workflow using either of these methods:
   - Drag and drop an activity directly onto a transition line to connect it to the adjacent activities. The transition line turns blue when the connection is made. The system updates the transitions automatically to reflect the new sequence.
• Drag the activity to an open area in the canvas and create the transitions manually. Click the yellow square on the right side of the activity condition and drag a connector to the next task.
2. You can draw multiple transitions from the same activity condition if the activity executes concurrently.
3. To remove a transition, click to highlight it, and then press Delete.

Custom activity transitions

Controls on the Approval - User activity enable an administrator to add additional workflow transitions to the activity other than the default transitions of Approved or Rejected.

Transitions defined using this method do not become a permanent feature of the Approval - User activity. After a new transition is configured, that transition must be applied manually to subsequent instances of the activity, where desired.

Manage workflow activity conditions

Activities contain default conditions that determine which transitions are followed.

For example, the Approval - User activity has two conditions, Approved and Rejected.

![Figure 779: Example of activity conditions](image)
You can use a JavaScript condition check to create custom conditions on Core workflow activities. (Custom activities do not support this feature.)

1. Right-click the activity and select Add Condition from the context menu.
2. In the New Workflow Condition dialog box, fill in the fields as appropriate (see table).

### Table 1355: New Workflow Conditions form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The label that is displayed on the workflow.</td>
</tr>
<tr>
<td>Activity</td>
<td>Name of the activity for which this condition is submitted. This value is populated automatically by the system.</td>
</tr>
<tr>
<td>Short description</td>
<td>Brief description of this condition.</td>
</tr>
<tr>
<td>Condition</td>
<td>A JavaScript condition check. The following variables are available:</td>
</tr>
<tr>
<td></td>
<td>• current: Current record that the workflow is running against.</td>
</tr>
<tr>
<td></td>
<td>• activity.result: Result value set by the activity upon completion.</td>
</tr>
<tr>
<td></td>
<td>• activity: Workflow Executing Activity (wf_executing) record. Used for advanced condition checks.</td>
</tr>
<tr>
<td></td>
<td>• activity.vars: Variables associated with the Workflow Executing Activity record. Used for advanced condition checks.</td>
</tr>
<tr>
<td>Skip during generate</td>
<td>If selected, the Generate activity does not follow this transition to generate approvals or tasks.</td>
</tr>
</tbody>
</table>

3. Click Submit.
4. To change the order in which conditions appear on the workflow activity, right-click the activity and select Reorder Conditions.

A dialog box appears, with a list of the available conditions.
5. Drag the conditions to a new position in the list.
6. Click OK.

Activity result value

The result value specified by an activity controls the condition through which the activity transitions.

Use the result value as part of the Condition field in the activity. For example, if the Condition field of an Approval - User activity contains activity.result == 'rejected', the activity transitions through that condition when a rejection is received from the approver. Result values are set in the Script field of the activity definition.

Edit the workflow activity properties form

Customize which workflow variables appear on an activity properties form and how the variables are arranged on the form.

1. Navigate to Workflow > Administration > Activity Definitions.
2. Scroll to the activity that you want to work with and click the activity name.
3. On the Workflow Activity Definition form, click the Edit Variables Layout related link.
4. On the Form Design page for the Activity Properties form, add and remove activity variables.
   The activity variables appear as separate items that you can rearrange on the form.
   For more details on using the form design interface, see *Using the form designer*. 
Using workflow approval activities and rolling back workflows

When you work with approvals, you need to understand how approval activities interact with approval engines, how to correct a skipped approval workflow activity, and how rollbacks work.

Approval workflow activities and approval engines

Approvals can be managed by approval activities or approval engines, but not both. Approval activities can be used if approval engines are not turned on for the table associated with the workflow.

Approvals can be managed by approval activities or approval engines, but not both. Trying to use both can cause a range of issues. Approval activites are not available (greyed out) in the palette if approval engines are used on the specified table. If you hover over a greyed out approval activity in the palette, a comment with more information is provided. For more information about approvals and approval engines, see Approvals on page 2404.

Figure 781: Unavailable approval activities

To turn approval engines off for the table, navigate to the System Properties > Approval Engines and change the setting for the table to Turn engines off.
Figure 782: Turn off approval engines

Correct a skipped workflow approval activity

While a workflow is in an active context, an approval activity can skip to the next activity.
An approval activity might skip for the following reasons:

- The approval user or group is missing or invalid (for example, sys_id).
- The approval user or group became inactive after the approval record was created.
- The activity is a dot-walked field, such as current.opened_by.department.manager, and it has a missing or invalid approval user or group.
- The business rule on the table that is associated with the workflow is invalid.

To correct a missed approval activity:

1. Navigate to Workflow Live Workflows All Contexts.
2. Click the date and time in the Started column for the workflow that is incorrectly processing approval activities.
3. In Related Links, click Show Workflow.
4. Review the portion of the workflow that executed, and then do one or more of the following:
   - Verify that after approval, the workflow progressed to the next activity. If a workflow failed to progress, check the business rules. For more information, see Debugging business rules.
   - Point to each processed approval activity to find activities where the State is Finished and Result is Skipped.
5. Navigate to Workflow Workflow Editor and open the workflow.
6. Double-click the skipped approval activity.
7. Click Users or Groups.
8. Assign an active user or group for the approval activity. For more information, see Workflow error handling on page 3348.

Rollback To activity

When conditions in a workflow trigger a Rollback To activity, the workflow moves processing backward to a specified activity in the workflow and resets certain activities that have already executed back to their original state. This is useful when handling an unexpected failure or as part of a programmed logical flow.

When an activity is reset during a workflow rollback, the following happens:

- Approvals are reset to Not Requested.
- Tasks are reset to either Open or Pending. A rollback workflow path cannot create new tasks.

Activities that perform external system operations, such as deleting a file or sending an email, are not rolled back. Only approval and task activity states are reset.

A workflow can contain a single rollback, multiple rollbacks, or nested rollbacks in more complex workflows. The Rollback To activity resets activities based on the actual workflow sequence (transition line attachments) of activities between itself and the transitioned to activity, rather than using the execution order to determine where processing should restart.

Rollback To behavior

The Rollback To activity transitions directly to the activity specified by the transition line arrow.

Use the Rollback To activity for all workflows that use multiple or nested rollbacks. Rollback To resets the targeted task (the direct transition) to Open. All tasks that have executed between the Rollback To activity and the targeted task (rolled back task) are set to Pending.

(0) Begin
(1) Log Message
(2) Task 1
(3) Task 3
(4) Task 2
(5) Timer
(6) Approval 1
(7) Roll back to first task
(8) Task 1
(9) Task 2
(10) Approval 1
(11) Log approval
(12) Join
(14) Send email
(15) End
Figure 783: Rollback to workflow

Transition history

The state of (3) Task 3 does not change, since this activity does not directly transition from the rollback target activity. To see what activities were rolled back, select the Workflow Transition History related list and look at the Rolled back column.

The Rollback To activity (7) updates the following activities:

(8) Task 1: reset to Open
(9) Task 2: reset to Pending
(10) Approval 1: reset to Not Yet Requested
Using variables in Notify workflow activities

Certain Notify workflow activities support variable substitution for reading text to callers.

Certain Notify workflow activities allow you to use variables, such as those from the workflow scratchpad, to determine the activity behavior. Each activity supports a maximum of 20 variables. The following activities allow variable substitution:

Table 1356:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Say</td>
<td>Supports variable substitution in the Text field only.</td>
</tr>
</tbody>
</table>
### Scratchpad variables

You can call variables from the workflow scratchpad or the activity scratchpad using the syntax `${variable_name}`. You do not need to include either `workflow.scratchpad` or `activity.scratchpad` before the variable name. For example, to use the variable `activity.scratchpad.langCode = 'en-US'`, call `${langCode}` within the activity. If the scratchpad does not contain the specified variable, the variable evaluates to an empty value.

You can get values from objects on the scratchpad using the format `${object.value}`. For example, you can get the name of a user object, such as `workflow.scratchpad.user = {name:'john.smith'}` by calling `${user.name}`.

#### The digit variable

The Input activity exposes the `${digit}` variable. Use this variable in each condition presented by the activity. The number read to the user is determined automatically by each condition. The caller can press that number to cause the activity to transition through that condition.

#### Use multiple timer activities in one workflow

Workflow timer activities store data independently of each other in an activity-specific scratchpad. Previously, all timer activities in a workflow accessed a single, shared scratchpad, which could lead to conflicts when adding multiple timer activities to one workflow.

Timer scratchpads entries hold these values:

- `workflow.scratchpad.endTime`
- `workflow.scratchpad.realStartTime`
- `workflow.scratchpad.retroactiveSecsLeft`

#### Publish a custom workflow activity

When a user creates a custom activity and saves or submits it, that activity appears in the Custom and Packs tabs of the designer palette, but is only visible to the user who created it.

When configuration is complete, the user clicks Publish, which makes the activity accessible to other users on the instance with the `workflow_admin` or `activity_creator` role. Published activities are available for upload to the ServiceNow Store, can be added to workflows, and can be edited by any user with the proper roles.

To edit a published activity, click Checkout. When an activity is checked out by a user, only that user can modify it. The fields of a checked out activity are read-only for all other users. When the checked out
activity has been modified successfully, the user publishes it again. The system adds a new version of this activity to the Custom tab in the Workflow Editor palette.

**Note:** Activities you create and publish are only visible in the Packs tab if they were created in the current application scope.

---

**Locked versions**

Problems can arise if an activity version is checked out by a user and not checked back in, for example, when the user is sick or leaves the company. An activity in this state cannot be checked out for update.

A user with the admin role can return a locked activity to a published state. The administrator opens the locked activity from the Custom tab of the Workflow Editor, selects the checked-out version, and selects Force Checkout, and then Publish.

**Workflow activity pinning**

Workflow administrators can *pin* a custom activity to prevent the system from automatically updating that activity when a new version is downloaded from the ServiceNow Store.

You can pin or unpin individual activities or set pinning within workflow properties that controls the versions used for all the activities in that workflow. This can result in two workflows using different versions of the same activity.

**Note:** Activity pinning and unpinning applies to the custom activities downloaded from the ServiceNow Store only, and does not apply to newly published activity definitions made locally on your instance. To make use of these locally updated custom activities, you must check out your workflow and manually add the activities.
Index

A
accessibility visual task boards 3193
account Twilio associating 946
Action Designer getting started 1225
activate task communication management 3023
tcm 3023
activate Service Portal 2614
activate Service Portal user criteria 2886, 2886
Active Directory
Orchestration activity pack 1841
Orchestration example 1820
activities
Active Directory activity pack 1841
activity packs requesting activation of 1755
Add F5 Pool Member 1886
Add F5 Profile to Virtual Server 1890
Add F5 Virtual Server 1892
Add User to Group 1841
Add User to Group Azure AD 1855
Assign User License 1856
Azure AD 1855
Change AD User Password 1842
Change Service State 1840
Check F5 Pool 1889
Check User Exists 1885
Copy File 1964
Create AD Object 1844
Create Directory 1965
Create User 1857
Create User in Users Table 1886
Delete F5 Pool 1895
Delete F5 Pool Member 1894
Delete F5 Virtual Server 1888
Delete User 1860
Disable AD User Account 1845
Enable AD User Account 1846
F5 load balancer 1886
File Copy 1977
File Read 1974
Files Compare 1973
Get Employee Info 1980
Get F5 Pool Member 1887
Get File List 1966
Get User Info 1861
Global activities 1988
Infoblox DDI 1897
Install Windows App 1938
Is AD Account Locked 1847
Join Domain 1937
Modify F5 Virtual Server 1891
PowerShell activity pack 1922
PowerShell HResult codes 1765
Probe activity pack 1943
Query AD 1848
Remove AD Object 1850, 1895
Remove File or Directory 1688
Remove User from Group 1851, 1862
Remove User License 1863
Rename File or Directory 1969
Reset AD User Password 1852
Reset User Password 1864
Restart Windows Server 1941
Secure Copy 1972
Set File Attributes 1970
SFTP File Transfer 1958
SSH activity pack 1972
Uninstall Windows App 1941
Unlock AD Account 1853
Update AD Object 1854
Update Employee Contact 1982
Update Employee Work Email 1983
Update User in Users Table 1987
Workday GlideActions activities 1985
activity designer
activity packs 1840
activity scoping 2098
auto-mapping JDBC output variables 2010, 2032
auto-mapping REST output variables 2063
auto-mapping SOAP output variables 2040
copying activities 2100
creating custom activities 1996
introduction to 1990
JavaScript probe activity, creating 2050
JavaScript Probe execution command 2053
JavaScript probe execution parameter 2051
JavaScript probe template post-processing parameters 2053
JDBC activity, creating 2027
JDBC connections 1018, 2030
JMS activity system setup 1020, 2096
JMS activity, creating 2094
JMS execution parameters 2097
JMS template post-processing parameters 2097
mapping output variables 2013
output variables 2011
parsing rules example 2019
parsing rules, creating 2014
parsing sources 2018
PowerShell 1923
PowerShell activity, creating 2055
PowerShell execution command 2002
PowerShell execution parameters 2057
PowerShell template post-processing parameters 2058
Pre-processing fields 2007
Probe activity, creating 2083
Probe execution command 2086
Probe execution parameter 2084
Probe template post-processing parameters 2085
REST activity, creating 2060
REST execution command 2066
REST execution parameters 2063
REST execution parameters, JavaScript array in 2065
REST template post-processing parameters 2065
reusing data 2102
run script activity, creating 2093
Run Script processing script 2094
SFTP activity, creating 2070
SFTP execution command 2078
SFTP template post-processing parameters 2077
SOAP activity, creating 2038
SOAP execution command 2043
SOAP execution parameters 2048
SOAP execution parameters, JavaScript array in 2049
SOAP input variables 2000
SOAP template post-processing parameters 2050
SSH activity, creating 2088
SSH execution command 2091
SSH execution parameters 2089
SSH template post-processing parameters 2090
Template conditions 2026
Template outputs 2013
Template post-processing fields 2009
templates 2027
testing input fields 2005
testing JDBC input fields 2035
variables, mapping 2001
add
actions 1000
add a service to a group 195
add blank line
email template 725
add CI 190
administering
context 3329
Legacy Notify 945
workflows 3329
AES 256
configure 1114
encryption key 1114
allocate users
to subscriptions 2909
allocate users to subscriptions 2914, 2915
Amazon EC2
instance 2231, 2231, 2234
Amazon Web Services
external credential storage
configure AWS credentials on a CyberArk vault 1078
configure the credential identifier for AWS 1070
Angular directives 2848
Angular providers 2848
Announcement display style 2878
announcement type 2878
API
MID Server encryption 1685
application service
history 204, 209
Approval Action
Input Variables 3373
Results 3373
States 3373
Approval and Rollback Activities 3373
Approval Coordinator
Conditions 3374
Input Variables 3374
Result Values 3374
States 3374
approval engines
set up 2406
Approval Group
Conditions 3377
Input Variables 3377
Result Values 3377
States 3377
Approval Info widget 2692
approval notifications
receiving 2422
Approval Record widget 2693
approval rules
gating approvals 2409
process guide 2413
Approval Rules
approval rule 2409
gating approvals 2409, 2411
set up 2409, 2411
approval summarizer
changing 2417
formatter example 2415
new custom, create 2418
Approval User
Conditions 3384
Input Variables 3384
Results 3384
States 3384
approvals
delegate 2240
generate
using approval rules 2421
using approvers related list 2422
using workflows 2422
status 2421
Architecture Compliance
activating 274
overview 275
overview module
using 275
process 275
roles 275, 278
arrange services in groups 195
assessable record
delete 2301, 2401
delete stakeholder 2309
assessable records
generate 2289
manage
automatically 2278
managing manually 2279
Assessable Records 2299, 2402
assessment take 2397
assessment groups 2274
assessment metric
    assessable record manage 2278
category
delete 2279
assessment metrics
    creating 2280
    data types 2284
    metric definitions, creating 2287
    metric templates 2302
    metric templates, creating 2302
    metric values, updating 2303
Assessment notification
    workflow 2321
assessment properties 2494, 2978
assessment questionnaires 2401
assessment trigger condition
    creating 2316
    example 2319
assessments
    categories, create 2275
    category users 2303
    category users, creating 2304
    change the order of an answer 2288
    clean up data 2313
    create metrics 2289
    create quizzes with forms 2363
    creating quizzes with forms 2348, 2363, 2364, 2372
    customize appearance 2493, 2977
    export 2298
    generate 2273
    generate assessable records 2289
    generate on-demand assessments 2310
    generate with on-demand API 2311
    import 2298
    installed components 2243
    instances 2314
    metric categories 2275
    notifications 2320
    on-demand assessments 2310
    on-demand for multiple assessable records 2311
    on-demand for one assessable record 2310
    process 2259
    publish metric types 2312
    results 2326, 2328
    schedule types 2312
    scheduled
        configure for 2312
        generate manually 2313
        vendor type, generating 2313
    scheduled assessments 2312, 2313
    signatures 2299
    stakeholders 2303
    stakeholders, creating 2304
    view instances 2314
assessments overview
    reports 2326
    roles 2326
assessments overview module 2326
Associate Service Portal with a catalog 2651
associating
    account
        Twilio 946
        Twilio account 946
audio files
    connect 490
auto-upgrade 1149
auto-upgrader 1149
automatic approval rules
    set 2408
automation status sets 1640
AutomationHub
    trigger a notification 1295
Azure AD activity pack
    Add User to Group 1855
    Assign User License 1856
    Create User 1857
    Delete User 1860
    Get User Info 1861
    Remove User from Group 1862
    Remove User License 1863
    Reset User Password 1864

B
Baseline
    creating 46
    differences displaying 47
Baseline CMDB 46
baseline, set 204
Basic Auth credentials 1029
basic search source
    table search source 2859
Blacklist IP Addresses 1163
bubble chart
    components 2330, 2333
    view 2328
bubble charts
    create 2329
    view 2328
business rules
    installed with live feed 535
    installed with task communications management 3026
    installed with tcm 3026
Business rules
    Notify 938
business service
    history 209
business service management
    maps 235
Business Service Management Map
    next generation version 240

C
Calculator widget 2695
call
conference
viewing 943
canceling
workflow 3333
Capacity subscriptions 2905
Catalog Content widget 2760
categories
survey management 2474, 2958
categories for assessments 2275
category results 2387
category users 2303
category users, creating 2304
certificate
configure 1110
https 1110
Certification
filters 301, 303, 305, 305, 307, 308
certification audit results
compliance view, viewing 296
deleting 294
viewing 291
Certification Audits 284, 284, 289, 298, 299, 300
Certification Follow On Tasks 309, 309, 313
certification templates
audit types 315
clones 324
creation 315
deletion 326
management 320
record lists 318
change history
viewing 204, 209
change record 204
change verification rule 49
channels
view 3035
chat 973
Chat
installed components
fields 975
script includes 977
chat action details 1002
chat actions 999
chat configuration 1370
chat room access rights
define 998
chat room message read access
change 998
chat window menu
adding
actions 1000
check in a document 1541
check out a document 1541
checklists
using with visual task boards
configuring checklists 3182
creating new checklists 3181
deleting checklists 3182
choice
Legacy Notify
creating 941
response 941
CI
cfg files 202
configuration files 202
proposed changes
add 48
displaying 48
Service Mapping
attributes 202
name labels 202
properties 202
CI class
reclassify 78
CI relation rollups
create 69
CI relations formatter
CI relationship builder 67
flat layout 60
tree layout 61
CI relationship editor 61
CI relationships
security 68
CI type
create 76
ClassName
methodName() 921, 922
Client
call(Object identifier) 929
Client(Object) 928
forwardCall(Object argument) 931
hangupCall() 930
mute(Boolean muted) 930
Notify WebRTC Client 928
pickupCall() 930
client software distribution (CSD)
activating 1787
configuration
retrieving SCCM data for 1802
SCCM server Discovery 1803
configuring providers 1817
creating catalog items for SCCM applications 1808
creating software models for SCCM 1804
dashboard 1815
deploying software from SCCM 1798
extension keys 1818
extension points 1816, 1818
installed components 1788
introduction 1786
lease extensions 1796
licenses and counters for 1793
ordering software from the service catalog 1793
plugins installed with 1789
properties for 1790
providing Windows credentials for SCCM 1801
revoking software not installed by SCCM 1813
roles installed with 1790
SCCM configuration 1804
SCCM deployment workflow 1812
SCCM software revocation
revoking software installed by SCCM 1812
SCCM software revocation workflow 1814
script includes installed with 1790

© 2018 ServiceNow. All rights reserved. 3475
tables installed with 1788
validating software installations 1812
workflows installed with 1792
cloning issues 1720
cloud management
credentials for 1032
CMDB
Extended 222
CMDB Classifications 70
CMS gauge
on a page, putting 414
what happens on a click, controlling 414
CMS gauge support 414
CMS to Service Portal transition 2616, 2620
CMS translation
viewing 460
color codes
Subscription Management 2922
com.glide.service-portal.user-criteria 2886
Common Information Model (CIM)
credentials for 1031
communication
channels 3035
communication channel
definition 3031
communication channels
view 3035
communication contact
definition 3032
communication management 3021
communication plan definition
create 3029
communication task
definition 3030
compare application service versions 209
compare business service versions 209
compliance
filter 302
Compliance
desired state reporting 281
installed with 266
scripted audits 338, 338, 346
compliance overview
module 272
Compliance Overview module 2921
condition
parameters 263
condition activities
if 3398
switch 3399
wait for condition 3403
wait for WF event 3404
conference
call
viewing 943
configuration
CMBD 70
CMDB 74
Related Lists of CI components 75
Configuration
Business service 188
configuration files
track changes 204, 209
Configuration Management
CI forms 221
related lists 221
configure
interaction connectors 1372
Configure a sentiment connector 2531, 3015
configure access to maps 196
configure access to services 196
Configure an assessment 2270
configure user access to services 196
configuring
endpoints
Twilio 948
Legacy notify
Twilio 946
Twilio
endpoints 948
Legacy notify 946
configuring email
alternate
POP3 605
SMTP 601
SMTP and POP3 608
connect
administering 484
audio notifications
customizing 490
chat mini windows
drag files 492
connect actions 490
connect interface 468
connect overlay
disabling 490
connect sidebar 470
connect workspace
conversation pane 476
conversation tools 476, 3185
installed components
properties 461
mentioning users 483
mini windows 472
notifications 478, 480
polling interval 489
properties 487
record conversations
disabling for all tables 498
disabling for specific tables 498
supported browsers 460
uploading a profile picture 481
visual task boards
sharing 483, 496, 3193, 3193
Connect 460
Connect administration
disable top-level domains 493
connect chat
administering 496
connect workspace
adding and removing conversation members 496
editing conversation details 495
conversation members
adding and removing 496
email notification interval 497
following a record 494
record conversations
enabling 497
starting conversations 494
using 494
Connect chat
browser notifications 479
disable 499
Connect Chat
activate 461
record cards 492
Connect chat notifications
browser support 479
Connect record card 492
connect support
activating 464
additional plugins 466
administering 508
administering queues 510
creating an incident from a conversation 505
dashboards for 512, 513
escalating a conversation 505
homepage for 512, 512
installed components
properties 465
making a queue accessible to end users 511
metrics for 512, 512
monitoring incoming conversations 499
sharing knowledge 501
transferring a conversation 502
Connect Support
add users to conversation 504
add users to support conversations 513
administration 513
chat states 506
Connect Support and Service Portal 514
Connect Support migration 508
Connect Support Service Portal 514
Connect Support Service Portal widget instance options 515
content management
corporate style guide 391
design 388
organize content 389
prepare data 391
prototypes 394
rapid web design 394
team members 391
Content Management
Apache Jelly engine 442
business rules 399
client script 399
configure a new site 401
configure list definitions 435
configure menu items 422
content block types 417
content blocks
catalog card block 433
detailed content blocks 441
dynamic blocks 433
Flash movie block 437
header block 418
iFrame 438
static HTML block 436, 436
content links 437
content pages 405
content site 400
content types 413
Content Types 413, 415
copy a page to create a template 412
copy a site 403
create a navigation menu block 419
create menu sections 421
customize the menu style 426
DIV-based layouts 449
element link examples 451
frame 447
global search 459
installed with 397
integration points 450
integration points example 457
Jelly
Examples 444
list block 434
login rules 404
master template 412
menu types 423
navigation 394
navigation menu example 432
roles 398
script includes 398
security 404, 405, 409, 447
set up site 399
single sign on 405
source view 452
style
design themes 446
frame 447, 447
frame UI macro 448
themes 446
style sheets 446
tables 397
testing 458
translation 459
URLs 404
Content Management integration points example 430
static methods 453
Content Management Integration Points
dynamic methods 455
iFrame method examples 440
manage system content 394
Content Management integration points
example 430
static methods 453
Content Management Integration Points
dynamic methods 455
iFrame method examples 440
manage system content 394
Content Management meta tags
hierarchy 449
page level 448
site level 448
content management system 388
Content Management System
activate 396
Content Management templates 410
content pages
add content 407
application 409
assign to a site 409
copy 409
create 405
Content types
configure 413
Content Types
view 415
context
workflow
administering 3329
contextual search
Service Portal 2873
Controls
managing 328, 330, 331, 335, 337
conversation
Legacy notify
viewing 942
Copy a quiz 2556
Copy a survey 2492, 2976
Copy an assessment 2302
create
bubble charts 2329
communication plan 3029
communication plan definition 3029
interaction 1373
Create a Survey Wizard
configure the survey 2593
create a dynamic effect 2591, 2592
create a survey page 2590
define a survey question 2589
test the survey wizard demo 2592
create a widget 2816
Create a widget 2839, 2839, 2841, 2843, 2845, 2848
Create an Advanced Wizard (Demo)
add a script 2606
add field setter 2605
create a panel 2605
create fourth panel 2606
create the wizard 2604
create third panel 2605
define a transition 2607
define a variable 2604
module in the asset contracts application 2609
publish the wizard 2609
test the wizard for a record with an asset 2608
test the wizard for a record with no assets 2607
create knowledge
access an external knowledge article 1447
creating
Legacy Notify
choice 941
question 940
response 941
creating quizzes with forms
available data types 2348
modify a published quiz 2372
select a user for a category 2364
set up a category 2363
credential alias for Orchestration activities 1079
credential issues after cloning 1720
credential tagging 1930
credentials
affinity 1057
applicative credentials 1028
basic authentication 1029
checking IP service affinity 1079
CIM 1031
cloud management 1032
creating 1023
CyberArk integration
configuration tasks 1074
CyberArk storage
configuring credential identifier 1077
configuring SNMPv2 credentials 1077
configuring the MID Server 1075
configuring the vault 1074
import the JAR file 1075
installing the AIM API 1074
debug 1058
external storage
activation of 1063
configuration of 1063
configuring identifier of 1068
importing a JAR file for resolution of 1067
external storage for 1060
introduction to 1021, 1992
JAR file 1064
JDBC 1037
JMS 1039
NetApp storage devices 1032
resolving 1064
SAP JCo 1041
SNMP 1042
SNMP community 1042
SNMPv3 1044
SSH 1045
VMware 1053
Windows 1054
crypto.policy parameter 1122
Ctrl-Alt-Del 2221
Ctrl+Alt+Del
Password Reset 2126
CyberArk configuration tasks 1074
configuring credential identifier 1077
configuring SNMPv2 credentials 1077
configuring the MID Server 1075
configuring the vault 1074
import the JAR file 1075
installing the AIM API 1074
introduction to 1071

D
dashboards
connect support 512
data archiving
activate push retention plugin 821
e-mail archiving 768
e-mail messages 766
manually archive push notifications 821
push notification retention 820
data certification
activating 348
certification audit definition 361
certification audit instances 360
certification element 359
certification instances 360
certification schedules 355
certification tasks 357
Data Certification installed 348
data certification overview module using 364
data driven board tasks 3172
data encryption
Orchestration activities 2007
data fetch script 2863, 2864, 2868
data table from URL definition widget 2702
data types
survey questions 2480, 2510, 2964, 2994
databus 2101, 2102
date and time user input 3121
decision matrix
creating 2390
decision matrixes
administering 2395
define
communication channel 3031
communication contact 3032
communication task 3030
contact responsibilities 3034
plan type 3033
recipient list 3032
responsibilities 3034
task type 3034
define access to services 196
define user access to services 196
defining
on-cancel script 3335
domain separation setup 1677
Discovery
credentials for
activating external storage 1063
affinity 1057
applicative credentials 1028
basic authentication 1029
checking IP service affinity 1079
CIM 1031
configuring external storage 1063
configuring identifier of 1068
creating 1023
CyberArk integration 1071
external storage 1060
importing a JAR file for resolution of 1067
JDBC 1037
JMS 1039
NetApp storage devices 1032
SAP JCo 1041
SNMP 1042
SNMP community 1042
SNMPv3 1044
SSH 1045
VMware 1053
Windows 1054
domain separation live feed UI action 519
document feeds
add show live feed button 519
configure 519
configure security 520
disable 520
installed components 520
live feed UI action 519
document publication
approval 1552
draft review 1555, 1557
electronic signature 1555
publish 1556
Documents
parameters 1544, 1545, 1545, 1546, 1546, 1547, 1548
domain separation
live feed 530
MID Server 1677
domain separation setup
Discovery 1677
dynamic approval forms 2423
Dynamic Service Portal page 2677, 2678

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Dynamic Service Portal page titles 2681

E

e-signature approval
   approval tables, selecting 2419
de-activate 2418
local database, setting up 2420
plugin, installed with 2419
SAML 2.0 authentication, setting up 2420
setting up 2421
ECC queue
   retry policy 1707
Edge Encryption
   adding proxies 1131
   attachment decryption job 1160
   attachment encryption 1159
   attachment encryption job 1159
   attachment key rotation job 1154
   attachments 1158
   configuration 1152
   configure 1199, 1199
database recovery job 1163
deactivate encryption 1156
decryption job 1157
dictionary attributes 1192
digital signature 1121
encryption application 1084
encryption change 1161
encryption deactivation 1156
encryption job 1156
encryption key management 1085
encryption patterns 1161
encryption proxy 1084
encryption rule actions 1172
encryption rule conditions 1171
encryption rules 1168, 1171
encryption type change 1161
deactivate 1156
encryption types 1087
field encryption 1155
file store 1126
getting started 1095
installation 1103
installed components tables 1089
installer 1105, 1106, 1110, 1111, 1114, 1115, 1115, 1117
instance configuration 1155
Java Cryptography Extension (JCE) installation 1122
Java KeyStore 1124
java.security policy file 1122
key management 1085, 1127
key rotation 1127, 1152
key store management 1085
keytool utility 1124
limitations 1101
Linux installation 1119
Linux uninstall 1133
Linux update 1151
mass encryption jobs 1162
mass key rotation job 1153
NAE key store 1125
order token repair job 1162
overview 1081
password encryption 1131
patterns 1087
prohibited keywords 1191
properties 1129
proxy download 1104
proxy properties 1136
proxy system requirements 1096
proxy update rollback 1152
proxy upgrade 1145
secure SSL connection 1121
set up encryption key 1123
set up keystore 1123
single key rotation job 1153
start the proxy 1115, 1117, 1131
stop the proxy 1132
user account 1104
web proxy configuration properties 1129
Windows installation 1119
Windows uninstall 1133
Windows update 1151
Edge Encryption environment
   memory 1099
   Number of proxy servers 1099
   redundancy 1099
     editing
   Legacy notify properties 950
   properties
   Legacy notify 950
   email
   accounts
   creating 614, 615
   testing 615
   alternate configurations 600
   attachment limit properties 646
   client
   display additional information 775
   SMS 780
   client interface 772
   configuration 597
   configuring email client auto-complete 774
   controlling access to the client 776
   creating an email client template 776
   customizing the client 774
   displaying an editable form field 779
   displaying the Reply To field 780
   existing users, matching 751
   filters
   activating 763
   creating 763
   inbound actions
   importing users 751
   inbound email
   action criteria 741
   inbound email action processing order
   configuring 760
   managing multiple filters in an inbound email action 761
inbound email actions
creating 745
example: creating a change request 757
eexample: handling email replies 756
example: logging a problem 757
examples 756
incoming mail server properties 640
next steps 649
notifications
baseline 691
creating a notification filter 848
forcing delivery 848
subscription-based
accessing 840
adding notifications 841
creating a service provider 843
filtering notifications with a schedule 849
making mandatory 847
OAuth 2.0 612
OAuth authentication
activating 612
outgoing mail server properties 640
quick messages 781
removing the email icon 783
service availability 597
setting the from address 779
size limits 644
size restrictions 597
standard configuration 598
system mailboxes 772
templates
applying to a notification 716
calendar integration 725
convert to HTML 716
creating 713
overriding a template value 720
the client 772
Email
additional properties 632
diagnostics 785
inbound mail configuration properties 624
outgoing mail configuration properties 621
properties 619
troubleshooting 785
Email API 784
email digests
configuring 875
enabling in notification preferences 879
intervals 874
properties 631
e-mail layout
creating 731
e-mail layouts 729
e-mail message
construct 720
e-mail notification
specifying HTML content of 731
e-mail notifications
applying a template 716
assignment groups 753
calendar integration
creating invitations for custom tables 727
mapping date fields to variables 727
content pages links 682
converting to Rich HTML 664
creating 649
creating categories 649
creating custom watermark 770
document attachments 670
editing HTML in notifications 669
e-mail 875
enabling record links 680
examples
approval request notification 707
assignment notification 703
priority 1 incident update 709
simple reminder 700
hiding watermarks 771
line breaks with rich HTML 671
omitting watermarks 771
overriding a template value 720
specifying alternative outbound email 675
specifying outbound email address for a language 676
subscription-based
advanced scripting for SMS 845
selecting a service provider 845
time zone 675
used by live feed 537
watermarks 769
e-mail objects
accessing with variables 749
e-mail retention plugin
activating 768
Email Service 784
e-mail template 731
e-mail variables 676
embed widgets example 2829
embedding widgets 2845
employee self-service 2231
Enable automatic updates to the shopping cart 2786
Enable automatic updates to the wish list 2777
enable e-mail
basic 600
basic e-mail 600
Enable new Service Catalog widgets in Service Portal 2758
enable Service Portal shopping cart widget 2783
Enable the wish list in Service Portal 2774
encryption
API for MID Server 1685
encryption proxy
adding proxies 1131
digital signature 1121
download 1104
encryption key management 1085
file store 1104
installer 1105, 1106, 1110, 1111, 1114, 1115, 1115, 1117
Java Cryptography Extension (JCE) installation 1122
Java KeyStore 1124
java.security policy file 1122
key management 1085
keytool utility 1124
Linux installation 1119
Linux uninstall 1133
Linux update 1151
NAE key store 1125
password encryption 1131
properties 1136
scheduled upgrade 1145
secure SSL connection 1121
start the proxy 1115, 1117, 1131
stop the proxy 1132
system requirements 1096
update rollback 1152
web proxy configuration properties 1129
Windows installation 1119
Windows uninstall 1133
Windows update 1151
endpoints
Twilio
  configuring 948
event management
  service groups 195
example
  menu items and content links 430
exclude
  users from subscriptions 2917
existing notification message filter
  edit 850
existing notification message schedule
  edit 850
existing users
  email, matching 751
export
  assessments 2298
export scorecard
  image 2462, 2946
external credential storage
CyberArk
  configuration tasks 1074
  configuring credential identifier 1077
  configuring SNMPv2 credentials 1077
  configuring the MID Server 1075
  configuring the vault 1074
  import the JAR file 1075
  installing the AIM API 1074
  JAR file for 1064

G

g_chat
  available methods 1002

General Scripting
  execution order of scripts and engines 2424
Generate
  Example 3389
  Input Variables 3389
  States 3389
geolocation
  activate 2425
  google key 2429
  history 2429
  tracking 2430
Geolocation
  installed 2426, 2426, 2426, 2426, 2429
glide.service_portal.user_criteria_enabled 2886
GlideElement 1533, 1535
global
  print(String message) 1191
guided board tasks 3172

H

hashtags
  security 533
header menu widget 2705
Hello World widgets 2705
help the help desk
  login script
    install 227
    use 227
Help the Help Desk
  detect software on 64-bit systems 233
  determine values for the Assigned to field 232
  Error message 233
  run script 229, 229, 233
  SOAP authentication 224, 224, 226, 226
  view scan results 232
Help the Help Desk password
  encode 228
help the help desk status
  access 230
history view 204, 209
homepages
  connect support 512, 512
  customize 2238, 2238
  delete 2238

I

I18N 1435, 1435
Identification 105
Identification and Reconciliation 105
identification types
  custom 2187
import
  assessments 2298
inbound email
  setting field values 754
inbound email actions
  locked out user 753
  processing workflow 735
  triggering 753
Inbound Email Actions
  example 758
inbound event
  integrate 754
inbound JSON request
  create notification 754
incident communication plan
  Notify number groups 900
incoming email
  values 759
Independent identification rule 107
Infoblox DDI activity pack
  Create Network 1917
  Delete Network 1920
  DHCP activities 1901
  DHCP Delete IP Reservation 1902
  DHCP List IP Reservations 1903
  DHCP Reserve IP v4 Address Range 1901
  DNS activities 1904
  DNS Delete 1910
  Get Network Details 1918
  IPAM activities 1911
  IPAM Delete 1916
  IPAM List IP Reservations 1914
  IPAM Register IP Address 1912
  IPAM Reserve IP Address 1913
  List DNS C-records 1905
  List DNS Record 1909
  List Registered Networks 1921
  network activities 1917
  Register DNS A-record 1906
  Register DNS C-Record 1907
  REST credential for 1897
  roles and permissions needed 1898
  workflows included with 1897
input variables
  parallel flow launcher 3442
install edge encryption 1119
Installation 1588, 1596, 1610, 1618, 1693
installed with
  Content Management business rules 399
  Content Management client script 399
  Content Management roles 398
  Content Management script includes 398
  Content Management tables 397
  task communications management 3024
tcm 3024
installed with task communications management
  business rules 3026
  roles 3025
  script includes 3028
  ui policies 3027
installed with tcm
  business rules 3026
  roles 3025
  script includes 3028
  tables 3024, 3024
  ui policies 3027
Instant Messaging 1003, 1003, 1004
Integrate
  Edge Encryption 1194
integration 1195
interaction
  activate 1367
  channel metadata 1372
  closed abandon intervals 1373
  context 1372
  create 1373
  routing 1372
interaction connector hooks 1368
interaction connectors 1372
interaction queues
  configuration 1370
  interaction states 1368
  interactions 1367
ITIL
  service design 40
  service transition 41
ITIL configuration management 42
ITIL Configuration Management integration 39

J

J2SSH
  long running commands 1679
JAR files
  synchronizing to MID Servers 1705
JDBC credentials 1037
JMS credentials 1039
JSON API 1185
JsonNode
  encodedQueryFor(String tableName) 1189
  getAsString() 1188
  getAsString(String propertyName) 1188
  getIterator(String xPath) 1187
  getName() 1189
  iterator() 1188
  valueFor(String tableName, StringfieldName) 1189
JsonNode API 1187
JsonNodeIterator
  hasNext() 1190
  next() 1190
JsonNodeIterator API 1190

K

KBBlock
  getArticleContent(Glide record) 1535
KBPtoralServiceImpl
  getResultData(JSON object) 1533
knowledge
  mobile access 1440
  view on mobile 1442
Knowledge
  Administration 1417
  Approve knowledge submission 1397
  article quality index
    configuration properties 1432
  Article view properties 1425
  Assign a manager 1411
  Category 1396
  create knowledge 1394
  Define a category 1410

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external content integration 1432
configuration properties
featured content 1399
feedback 1392
Import a document 1397
Knowledge base form 1417
Knowledge homepage properties 1428
Knowledge search properties 1423
Manager 1399
migrating access controls 1448
mobile search 1443
Move an article 1396
Other knowledge properties 1428
pin an article 1399
portal properties 1420
properties 1420
Publish and retire workflows 1419
Retired knowledge articles 1397
search changes 1446
searching knowledge 1382
Supported import elements 1397
user criteria 1400
user criteria for an article 1408
Workflows 1419
Knowledge document
Installed with 1550
knowledge settings fields 1551
View linked knowledge 1551
Knowledge management
Request a knowledge base 1393
Service catalog 1393
Knowledge Management
Actionable Knowledge Feedback Properties 1433
activate plugin 1378
Article quality index 1502
article templates 1507
article versioning
activate plugin 1462
approve article being reviewed 1458
compare versions 1459
configuration properties 1430, 1456
create new article version 1457
disable article versioning 1460
feedback on versions 1454
manually update customized files 1451
overview 1451, 1455, 1456
recall article being reviewed 1458, 1459
revert previous version to published 1458
version information 1455
versioning changes 1452
view all article versions 1459
assign AQI checklist to knowledge base 1504
Automate feedback management 1517
case-to-article creation 1439
create a new article template 1509
create an AQI checklist 1503
create an article from a case 1399
define an external knowledge source 1512
delete questions from a checklist 1505
duplicate article numbers 1436
Enable actionable knowledge feedback 1517
external content integration 1511
Generate SEO tags for knowledge articles 1511
homepage 1380
internationalization 1435, 1435
Knowledge Advanced plugin 1378, 1462
Knowledge Management Service Portal 1489
Knowledge Service Portal
homepage 1466, 1467
overview 1461
search results page 1470
knowledge subscription
configuration properties 1431
knowledge subscriptions 1499, 1499, 1500, 1500, 1500, 1501, 1501, 1502, 1502
open search results content 1514
Perform AQI 1505
remove an AQI checklist 1505
roles 1379
run an import job 1513
secure article template using encryption context 1510
Service Portal
configuration properties 1466
set up 1375
Social Q&A properties 1429
submissions 1448
Track progress on feedback task 1519
view all pending and completed AQI checklists 1507
Work on feedback task 1518
Knowledge Management (diagnose user criteria for articles) 1415
Knowledge Management (diagnose user criteria for knowledge base) 1412
Knowledge Management (User Criteria Diagnosis) 1412
Knowledge Management Service Portal
widgets 1477, 1478, 1479, 1480, 1480, 1481
Knowledge submissions 1448
Knowledge subscriptions
email notification templates 1500
knowledge subscription notifications 1502
knowledge subscription properties 1499
manage knowledge subscriptions 1502
subscribe to knowledge article 1500
subscribe to knowledge base 1500
unsubscribe from knowledge article 1501
unsubscribe from knowledge base 1501
Knowledge v3
after migration 1445
default knowledge base 1445
knowledge article view 1446
knowledge portal changes 1447
migrate knowledge content 1450
migrating functionality 1448
migration guide 1444
publish and retire workflows 1450, 1450
replace modules 1448
security changes 1446
using legacy knowledge 1445

L
layouts
email 729
legacy chat
installed components
business rules 978
properties 975
tables 977
use legacy chat 979
legacy chat migration 508
Legacy notify
conversation
viewing 942
properties
editing 950
viewing 950
public conference calls 945
Twilio
configuring 946
viewing
conversation 942
Legacy Notify
account status messages 951
administering 945
call
conference 943
conference call 943
Conference call participants 952
legacy survey
migrate 2533, 3017
legacy surveys
migrate 2532, 3017
Linux 1131
live feed
access from CMS pages 533
administer 518
bookmarking feeds 582
bookmarking hashtags 582
disable record feed 520, 522
document feeds 518, 519
domain separation 530
hashtag security 533
installed with 534
limit access by role 532
managing message content 532
table access rules 530
table notification
related feeds 529
workaround posted 526
table notifications
non-task example 528
problem resolved example 527
task table notifications 523
team security 533
live Feed 516
Live Feed
activating 518
added to your homepage 583
browser support 518
following feeds 582
following other users 578
messages 575
multiple records 563
post a message 585
post content in live feed
post a message 585
records 556, 558, 559, 559, 562, 562, 563, 564
selecting feeds 580
UI usage 573
update profile 573
using 538
using social IT
post content in live feed 585
viewing another user 576
live feed teams
security 533
load balancers
F5 custom Orchestration activities 1886
locked out user
inbound email actions 753

M
manage
communication 3021
task communication 3021
managed document record
create 1540
managed documents 1536
Managed Documents
cancel a document 1562
check in a document 1561
check out a document 1563
concepts 1536
copy a document 1561
create a document 1552
create a document collection 1563
create or request a new document 1558
deactivate a document 1561
features 1536
install plugin 1538
plugin 1538
reopen a deactivated a document 1562
roll back a document 1562
specify an approver 1560
upload a document 1564
manager notifications
enabling 2320
Manual Approvals
Conditions 3392
Input Variables 3392
Result Values 3392
States 3392
manually install
proxy server 1119
Max User subscriptions 2905
message
Legacy Notify
viewing 942
metric result
field names 2448, 2933
Metric Results 2322
metric types
create 2289
Metric Types 2299, 2402
metricbase 1570
NG CI relations formatter 56
Nmap
    installation 1694
notification
    calendar integration 725
Notification Activities
    Create Event 3415
    Notification Activity 3415
notification channels 828
Notification conditions
    email digests 829
notification message
    subscribe 838
notifications
    deactivate for surveys 2528, 3012
    editing devices 838
    email client
        configuring email client auto-complete 774
        controlling access to 776
        customizing 774
        displaying an editable form field 779
        displaying the Reply To field 780
        user interface 772
        quick messages 781
        removing the email icon 783
        setting the from address 779
        SMS 780
    email digests 871
    email unsubscribe links 682, 850
    image filtering properties 630
    message body limit properties 644
    previewing 672
push
    activating 793
    architecture 790
    business rules 795
    components 795
    creating a content record 810
    creating a push action 815
    creating a push message 799
    creating a push notification 801
    creating an attribute definition 812
    creating an attribute value 814
    example 816
    handling failed messages 819
    installed with 794
    properties 796
    push application 806
    register 802
    responses 790
    REST messages 795
    roles 795
    setup with a custom mobile app 804
    setup with the ServiceNow mobile app 797
    tables 794
    setting up devices on user preferences 836
Notify
    activate 881
    API 907
    Associate a number to a group 885
    Business rules 938
    call(String notifyPhoneNumber, String toPhoneNumber,
        GlideRecord conferenceCall) 909
    call(String notifyPhoneNumber, String toPhoneNumber)
        908
calls 887
    Client example 934
    Conference call 887
    conferenceCall() 914
    Configure Twilio 882
    Create a number group 883
    Creating Notify activities 898
dispatchActivity(GlideRecord callRecord) 915
differences between Notify and Legacy Notify 882
disconnect from Twilio 885
event handlers 898
events 898
    Forward call activity 892, 3406
    forwardCall(GlideRecord call, String destination, String
        dtmf) 916
    getAvailableClients(String notifyNumber) 913
    getChildCallIDs(GlideRecord callRecord) 911
    getParentCallID(GlideRecord callRecord) 911
    getPhoneNumbers() 907
    getShortCodes() 912
    getTokens() 912
    getTokens(GlideRecord record) 913
Hang up activity 894, 3408
    incoming calls
        processing 886
    Input activity 893, 3406
    installed components 935
    kick a participant 887
    kick(GlideRecord user) 915
    Languages 899
    migration 881
    mute a participant 887
    Notify on task 899
    Notify with incident communication plan 900
    Notify with on-call scheduling 905
    Number groups 900
    On-call: assign by acknowledgement workflow 906
    Outbound requirements 886
    Play activity 895, 3408
    Properties 937
    queueCall(GlideRecord callRecord) 914
    Record activity 895, 3409
    Reject activity 896, 3409
    Roles 935
    Say activity 896, 3410
    sendSMS(NotifyPhoneNumber notifyPhoneNumber,
        String toPhoneNumber, String messageBody,
        GlideRecord source) 910
    sendSMS(NotifyPhoneNumber notifyPhoneNumber,
        String toPhoneNumber, String messageBody) 910
    Tables 935
    Using SMS 888
    variable substitution 3469
    WebRTC Client event handlers 932
    workflow activities 888, 3405
    Notify on task
        Conference call from task 900
        SMS from task 899
Notify with Incident Communications Management
Conference call 901
conference call information 903
launching 901
sending 905
SMS Notifications 905
viewing 903
Notify with on-call scheduling
NotifyNow key differences 906
Set up 905
NotifyAction
addConference() 923
addDial() 917
addGather() 917
addHangUp() 918
addPlay() 919
addQueue() 918
addReject() 919
addSay() 920
fromJson(String json) 921
NotifyClient
SendDtmf(String digits) 931
NotifyNow
addConferenceCallParticipant(String conferenceCall, String participant) 968
convertLocalPhoneNumberToE164(String userID, String phoneNumber) 969
getConferenceCallParticipants(String conferenceCallId, Boolean isCallable) 970
getFrequentlyCalledUsers(Number limit) 971
getPreferredE164SMSNumber(GlideRecord user) 972
getPreferredE164VoiceNumber(GlideRecord user) 971
getPreferredEmailAddress(GlideRecord user) 972
getReadyState() 956
getStatus() 957
initiateConferenceCall(String, String, GlideRecord, Boolean) 959
isCallable(String participant) 960
isSMSCapable(String user.ID) 962
isVoiceCapable(String user.ID) 962
kick(GlideRecord participant) 963
mute(GlideRecord participant) 964
sendEmailQuestion(String emailAddress, String question, GlideRecord sourceRecord, String emailSubject) 965
sendSMS(String phoneNumber, String smsBody, GlideRecord source) 966
sendSMS(String phoneNumber, String smsBody, String question, GlideRecord sourceRecord) 967
SMS codes 2159
umute(GlideRecord participant) 964
NotifyPhoneNumber
getCode() 924
getID() 924
getNumber() 925
getOwner() 925
getTerritory() 925
supportConferenceCall() 926
supportIncomingPhoneCall() 926
supportOutgoingCall() 927
supportOutgoingSMS() 927
supportRecording() 927
supportWebRTC() 928
Now Platform 9
O
ODBC Driver 1195, 1197
ODBC truststore 1197
On-call scheduling with Notify
Force communication channel 906
on-cancel
script defining 3335
one assessable record one category user, associating 2308
Orchestration activating 1744
Active Directory example 1820
Active Directory activity pack
Add User to Group 1841
Change AD User Password 1842
Create AD Object 1844
Disable AD User Account 1845
Enable AD User Account 1846
introduction 1841
Is AD Account Locked 1847
Query AD 1848
Remove AD Object 1850
Remove User from Group 1851
Reset AD User Password 1852
Unlock AD Account 1853
Active directory user management 1819
activities for workflows reactivating deprecated activities 1757
activity designer
activity scoping 2098
auto-mapping JDBC output variables 2010, 2032
auto-mapping REST output variables 2063
auto-mapping SOAP output variables 2040
creating custom activities 1996
JavaScript probe activity, creating 2050
JavaScript Probe execution command 2053
JavaScript probe execution parameters 2051
JavaScript probe template post-processing parameters 2053
JDBC activity, creating 2027
JDBC connections 1018, 2030
JMS activity system setup 1020, 2096
JMS activity, creating 2094
JMS execution parameters 2097
JMS template post-processing parameters 2097
mapping output variables 2013
output variables 2011
parsing rules example 2019
parsing rules, creating 2014
parsing sources 2018
PowerShell 1923
PowerShell activity, creating 2055

© 2018 ServiceNow. All rights reserved. 3488
Powershell execution command 2002
Powershell execution parameters 2057
Powershell template post-processing parameters 2058
Pre-processing fields 2007
Probe activity, creating 2083
Probe execution command 2086
Probe execution parameters 2084
Probe template post-processing parameters 2085
REST activity, creating 2060
REST execution command 2066
REST execution parameters 2063
REST execution parameters, JavaScript array in 2065
REST template post-processing parameters 2065
reusing data 2102
run script activity, creating 2093
Run Script processing script 2094
SFTP activity, creating 2070
SFTP execution command 2078
SFTP template post-processing parameters 2077
SOAP activity, creating 2038
SOAP execution command 2043
SOAP execution parameters 2048
SOAP execution parameters, JavaScript array in 2049
SOAP input variables 2000
SOAP template post-processing parameters 2050
SSH activity, creating 2088
SSH execution command 2091
SSH execution parameters 2089
SSH template post-processing parameters 2090
Template outputs 2013
Template post-processing fields 2009
templates 2027
testing input fields 2005
testing JDBC input fields 2035
variables, mapping 2001
activity packs
requesting activation 1755
applications included with 1766
Azure AD activity pack
Add User to Group 1855
Assign User License 1856
Create User 1857
Delete User 1860
Get User Info 1861
Remove User from Group 1862
Remove User License 1863
Reset User Password 1864
basic activities 1756
client software distribution
SCCM deployment workflow 1812
client software distribution (CSD)
activating 1787
components installed with 1788
configuring providers 1817
creating catalog items for SCCM applications 1808
creating software models for SCCM 1804
dashboard 1815
deploying software from SCCM 1798
extension keys 1818
extension points 1816, 1818
introduction to 1786
lease extensions 1796
licenses and counters for 1793
ordering software from the service catalog 1793
plugins installed with 1789
properties for 1790
providing Windows credentials for SCCM 1801
retrieving SCCM data for 1802
roles installed with 1790
SCCM configuration 1804
SCCM server Discovery 1803
SCCM software revocation workflow 1814
script includes installed with 1790
tables installed with 1788
validating installations 1812
workflows installed with 1792
configuration for on Workday 1830
configuring client software distribution
revoking software not installed by SCCM 1813
credentials for
activating external storage 1063
affinity 1057
basic authentication 1029
checking IP service affinity 1079
CIM 1031, 1044, 1045
cloud management 1032
configuring external storage 1063
configuring identifier of 1068
creating 1023
CyberArk integration 1071
external storage 1060
importing a JAR file for resolution of 1067
JDBC 1037
JMS 1039
NetApp storage devices 1032
SAP JCo 1041
SNMP 1042
SNMP community 1042
VMware 1053
Windows 1054
data encryption 2007
databus 2101
documentation links for 1741
elements 1819
examples 1819
Exchange activity pack
configuring MID Server for 1867
Create Address List 1868
Delete Address List 1869
Delete Mailbox 1878
Disable Mailbox 1880
Enable Mailbox 1881
Get Address List 1871
Get Address List 1874
Get Mailbox 1883
Get Mailbox 1884
Move Address List 1872
update address list 1875
F5 custom activities 1886
F5 Network Management activity pack
Add F5 Pool 1895
Add F5 Pool Member 1886
Add F5 Profile to Virtual Server 1890
Add F5 Virtual Server 1892
Check F5 Pool 1889
Delete F5 Pool 1895
Delete F5 Pool Member 1894
Delete F5 Virtual Server 1888
Get F5 Pool Member 1887
Modify F5 Virtual Server 1891

Global activities
introduction 1988
how probes work 1760

Infoblox activity pack
Create Network 1917
Delete Network 1920
DHCP activities 1901
DHCP Delete IP Reservation 1902
DHCP List IP Reservations 1903
DHCP Reserve IP v4 Address Range 1901
DNS activities 1904
DNS Delete 1910
Get Network Details 1918
IPAM activities 1911
IPAM Delete 1916
IPAM List IP Reservations 1914
IPAM Register IP Address 1912
IPAM Reserve IP Address 1913
List DNS C-records 1905
List DNS Record 1909
List Registered Networks 1921
network activities 1917
Register DNS A-record 1906
Register DNS C-Record 1907
REST credential for 1897
roles and permissions needed 1898
workflows included with 1897
introduction to 1741
list of activities 1749
list of plugins 1745
MID Server autofinder
mapping IP addresses to DNS names 1682
MID servers 2103
PowerShell
credential tagging 1930
Powershell activities
enable WMI Windows Installer Provider 1939
PowerShell activities
basic 1762
Run PowerShell 1762
Powershell activity pack
Change Service State 1940
Install Windows App 1938
Join Domain 1937
Restart Windows Server 1941
Uninstall Windows App 1941
PowerShell activity pack
HRresult codes 1765
introduction 1922

PowerShell protocols
introduction to 1923
MID Server PowerShell files 1924
probe activities
Resolve DNS Name 1943
SNMP Query 1944
Test Server Alive 1989
Probe activity pack 1943
publishing custom activities 2099
returning locked activity to published state 2099
runtime plugin 1747
SCCM activity pack
activating 1945
Add to Device Collection 1946
Add to User Collection 1947
configuring MID Server for 1801, 1946
Get Applications 1948
Get Deployments 1950
Get Device Collections 1952
Get User Collections 1953
introduction to 1945
Remove from Device Collection 1956
Remove from User Collection 1957

SCCM software revocation
revoking software installed by SCCM 1812

SFTP File Transfer activity pack
Copy File 1964
Create Directory 1965
Get File List 1966
Remove File or Directory 1968
Rename File or Directory 1969
Set File Attributes 1970
workflows included with 1959

SSH activity pack
File Copy 1977
File Read 1974
Files Compare 1973
Secure Copy 1972

SSH legacy activities
File Replace String 1978
File Write 1975
introduction to 1765
Reset Linux User Password 1979
Run Command 1765
Run SCP 1766
Update AD Object custom activity 1854
Workday
activating 1828
Workday activity pack
Check User Exists 1885
Create User in Users Table 1886
Get Employee Info 1890
GlideActions activities 1985
Update Employee Contact 1982
Update Employee Work Email 1983
Update User in Users Table 1987
Workday configuration for 1828
Workday credentials for 1829
Workday email triggers
adding notification types 1833
Workday notifications for 1836
Workday properties for 1831

© 2018 ServiceNow. All rights reserved. 3490
Workday workflow 1838
Orchestration ROI
 automation entry record 1767
correlated task rules 1769
installed components
  business rules 1773
  client scripts 1773
  plugins 1771
  roles 1771
  script includes 1772
  tables 1770
  UI actions 1772
introduction 1766
labor rate card 1767
premium reports
  scheduled job for 1785
reports
  activating premium plugin 1784
  introduction to 1773
  premium 1782
  standard 1773
standard reports
  properties for 1781
  scheduled job for 1781
time range for calculations 1770
order-preserving database 1115
Order-preserving encryption 1100
organize services in groups 195

P
PA Indicator subscriptions 2905
page ID 2684
Page Route Maps 2684
page subheader 2673
page templates 410
panel flow
  basic 2575
panel transition
  define 2576
parallel flow launcher
  example use of 3447
  input variables 3442
  script values in 3446
  subflow activities 3442
WorkflowCoordinator object 3445
parameters
  condition 263
  script 263
ParameterValue
  encodedQueryFor(String tableName) 1178
toString() 1177
valueFor(String tableName, String fieldName) 1178
Password Change
  design the process 2136
  reports 2212
password reset
  activate 2112
  enroll 2215, 2219
  enroll Email verification 2220
  enroll Google Authenticator 2221
  enroll SMS 2220
  password reset orchestration add-on 2112
  SMS codes 2159
Password Reset
  Active Directory 2150
  AD credential store 2151
  advanced configuration 2179
  Advanced tab 2136
  auto-enroll 2184
  CAPTCHA 2178
  credential store connections 2148, 2154
  credential stores 2145
  custom credential stores 2188
  custom identifications 2187
  custom verifications 2184
  customize 2180
  data confirmation 2157
  design the process 2136
  Details tab 2136
  example scripts 2191
  extension scripts 2197, 2198, 2207
  installed with 2112
  NotifyNow SMS verification 2159
  overview 2129
  personal data 2157
  plan the process 2136
  properties 2164
  reports 2212
  script includes 2189
  Security Questions 2159, 2181
  service desk-assisted 2208
  SMS verification 2158
  SOAP credentials 2154
  unblock users 2210
  user lockout 2177
  user requests 2209
  verification types 2184
  verifications 2155, 2157, 2183
Windows Application 2126
Password Reset CMS Integration 2211
pending
  allocation to subscriptions 2916
Per-User subscriptions 2905, 2909
Perform Data Certification
  cancel a certification instance 384
  cancel all tasks in an instance 387
  cancel an individual task 387
  cancel certification tasks 387
  certification task form 384, 386
  certification task list 385, 386
  certify an element 380
  escalate a certification task 384, 385
  export the certification list 379
  fulfill certification tasks 378
  mark certification task as closed incomplete 386
  reassign a certification task 385
  reset certifications 382
  send certification task reminders 385
  send email reminder 386, 386
  track a certification task 384
  track task with certification instance 382
  view an audit result 381
Performance analytics
dashboards
connect support 513
pinning
in workflows 3471
pinning MID Servers 1619
plan type
define 3033
Planning Data Certification 366, 366, 371, 375, 376, 377, 378
platform 9
plugins, subscription 2906
populate CMDB
computer information 2239
Populate services 189
Portal CSS 2651
post content in live feed
add @mentions 594
add a knowledge article link 592
add a link 591
add a poll 592
attach files 587, 587
attach images 587
attach knowledge articles 587
attach links 587
clipboard 589
copy an image 589
delete a message 595
like a message 595
message 582, 594
messages 587
post 587, 591, 592
reply 587, 591, 592
reply to a message 585
Powershell
Change Service State activity 1940
Install Windows App activity 1938
Join Domain activity 1937
Restart Windows Server activity 1941
Uninstall Windows App activity 1941
PowerShell
HResult codes 1765
Orchestration activity pack 1922
protocols
introduction to 1923
MID Server PowerShell files 1924, 1930
troubleshoot authentication failure
Active Directory activity 1933
troubleshooting 1933
troubleshooting authentication failure
Exchange activity 1934
troubleshooting RCP server 1935
privileged commands
adding for MID Server 1680
configuring for MID Server 1680
MID Server
pbrun special configuration 1682
probe activities
Resolve DNS Name 1943
SNMP Query 1944
Test Server Alive 1989
Probe activity pack
introduction 1943
problem management
creating knowledge 1447
properties
Legacy notify
editing 950
viewing 950
MID Server 1644
Properties
Notify 937
proposed changes
create validation script 51
edit validation script 51
verify 50
proxy database 1115
Proxy database
size 1100
Proxy Error Reports 1199
Proxy performance dashboard 1199
proxy server
set initial memory 1129
set memory 1129
set upper bound memory 1129
proxy server installation 1119
publish a document
managed documents 1542
Publishing Wizards 2580, 2581, 2582, 2583
put the class name here 1533, 1535
Q
question
Legacy Notify
creating 940
viewing 939
questions
in quizzes 2365
quiz
questions 2365
quiz designer 2349, 2354, 2360, 2362, 2362, 2373, 2373,
2376, 2377, 2540, 2544, 2553, 2554, 2555, 2556, 2556,
2557, 2557
Quiz Designer
tools 2349, 2540
Quiz Overview module 2349, 2539
quiz reports 2377, 2569
quiz scorecards 2335, 2378, 2378, 2379, 2381, 2383, 2385,
2562, 2563, 2565, 2567
quizzes
activate 2349, 2539
administer 2345, 2538
categories 2346, 2536
category user 2346, 2536
create 2353, 2543
process 2345, 2538
questions 2346, 2536
roles 2346, 2536
set up 2345, 2538
templates 2346, 2536
R

recipients list
  define 3032
Reconciliation 105
record feed 562, 563
record feeds
  add live feed 522, 522
  configure 522
  configure security 523
  context menu 522
  disable 520, 522
  form header 522
relationship editor
  filter list of CI relationships 62
  select a CI relationship type 62
  select targets 62
relationship filter
  create 59
  edit 59
replace CI 190
report lowest table
  Glide hierarchy 3305
reports
  Orchestration ROI
    premium 1782
    standard 1773
  premium for Orchestration ROI
    activating plugin 1784
    subscriptions 2919, 2921
request
  getAsJsonContent() 1173, 1177
  getAsXmlContent() 1174, 1177
  XMLContains(String path) 1174
request API 1173
reset your password 2221
response
  Legacy Notify
    choice 941
    creating 941
responsibilities
  definition 3034
REST API 784
ROI for Orchestration
  automation entry records 1767
  correlated task rules 1769
installed components
  business rules 1773
  client scripts 1773
  plugins 1771
  roles 1771
  script includes 1772
  tables 1770
UI actions 1772
introduction to 1766
labor rate cards 1767
premium reports
  scheduled job for 1785
properties for 1781
standard reports
  scheduled job for 1781
time range for calculations 1770
roles
  desired state 279
  installed with task communications management 3025
  installed with tcm 3025
  MID Server 1591
  user set 2907
Roles
  Notify 935
  rollback to
    behavior 3395, 3466
Rollback To
  States 3394
  rollback to activity 3397, 3466
  RSA key pair 1110
S

SAP credentials 1041
Save business service as IT service 188
SC Categories widget 2767
SC Order Guide Widget 2771
SC Scroll to top widget 2788
SC Shopping Cart widget 2781
SC Wish List Cart widget 2773
SCCM
  configuring collections for 1804
  creating catalog items for 1808
  creating software models for 1804
  deploying software with client software distribution (CSD) 1798
  deployment workflow 1812
  discovering SCCM server 1803
  lease extensions 1796
  ordering software from the service catalog 1793
  retrieving data for client software distribution 1802
  revoking software installed by another process 1813
  revoking software installed by another process 1812
  revoking software with 1812
  software revocation workflow 1814
  validating deployments 1812
  Windows credentials for 1801
SCCM activity pack
  activating 1945
  Add to Device Collection 1946
  Add to User Collection 1947
  configuring MID Server for 1801, 1946
  Get Applications 1948
  Get Deployments 1950
  Get Device Collections 1952
  Get User Collections 1953
  introduction to 1945
  Remove from Device Collection 1956
  Remove from User Collection 1957
SCCM cmdlet libraries 1800
SCCM configuration 1798
SCCM roles 1798
schedules
  Notification conditions 829, 829, 829
Scoped GlideElement 1533, 1535
scorecard
  view 2451, 2935

© 2018 ServiceNow. All rights reserved. 3493
scorecards
averages 2335
categories 2336
category metrics 2337
head to head compare 2338
history 2341
links
create 2333
live feed 2342
surveys
average ratings 2455, 2939
category results 2451, 2935
history 2457, 2941
question results 2453, 2937
view 2333
Scorecards
ratings 2345
script
on-cancel
defining 3335
parameters 263
script includes
installed with live feed 535
installed with task communications management 3028
installed with tcm 3028
Scripted Audits
scripting methods 346
search
Service Portal 2856, 2859, 2863, 2864, 2868
Security
Orchestration Runtime plugin 1747
Security Operations spoke 1315
Security Questions
Password Reset 2159, 2181
self-service password reset 2133
self-signed certificate 1197
send document out
approval 1543
review 1543
Sentiment analysis for surveys 2530, 3015
Sentiment analysis properties 2532, 3016
Sentiment analysis results 2532, 3016
SEO meta tags 2677, 2678
Server scripting
email notifications 685
Server Scripting
email notifications
changing link text 681
enabling links 680
example scripts 687
linking to related records 681
mail script API 686
using JavaScript 685
service administration
wizard 2578
Service Catalog
UI Macro 2633
Service Catalog forms 2620
Service Catalog requests
add new request items 2231
create incident
create change request 2237
delete request items 2234
place a request 2235
view request status 2238
service delegation 2240, 2240
Service Desk 1003, 1003
service mapping
service groups 195
Service Mapping
business service 190
changes 204, 209
compare configuration files 204, 209
configuration files 204, 209
credentials for
applicative credentials 1028
IT service 190
map 190, 190
MID Server 1583
view configuration files 204, 209
WinRM 1694
service portal 2816
Service Portal
advanced search source 2863, 2864, 2868
before you begin 2611
Branding Editor 2653
carousel widget slides 2696
Catalog Item Widget 2765
CMS 2614
Config Overview widget 2790
contextual search 2873
core concepts 2612
create user criteria 2886
custom CSS 2656
debug URL redirects 2881
edit widget option schema 2819
Faceted Search widget 2725
homepage 2674
KB News Widget 2743
KB search widget 2745
KB View 2 2749
KB View widget 2747
Language Switch widget 2712
Link button widget 2712
login page configuration 2880
login widget 2713
My Favorite Tags widget 2749
My Requests widget 2713
nested widgets 2827
page
create 2668
Page Map widget 2794
pages 2665
portal 2647
Portal Config widget 2792
Portal Map widget 2794
properties 2646
public pages 2881
redirect after login 2880
role-based pages 2881
Sample Footer widget 2719
Save Bundles widget 2778
Saved Carts widget 2779
search 2856

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SNCSH
  long running commands 1679
SNMP community credentials 1042
SNMP credentials 1042
SNMP OIDs
  for MID Server IP range auto-assignment 1640
SNMPv3 credentials 1044
social it administration
  get started 974
  social it 974
Social IT Administration
  set up chat queues for help desk chat 1006, 1006, 1007, 1008, 1008, 1009, 1009
Social Q&A
  Answer a question 1389
  ask a question 1389
  comment 1390
  delete a question 1391
  edit a question 1390
  enable questions in a knowledge base 1388
  Language support 1391
  notifications 1390
  question 1388
  share a question 1391
  subscribe to a question 1390
  tags 1392
  vote 1390
software licenses
  creating licenses and counters for CSD 1793
solution 234, 514, 1450
SSH
  Update AD Object orchestration activity 1854
SSH activities
  File Replace String 1978
  File Write 1975
SSH activity pack
  File Copy 1977
  File Read 1974
  Files Compare 1973
  introduction 1972
  Secure Copy 1972
SSH credentials 1045
SSH legacy activities
  introduction 1765
  Reset Linux User Password 1979
  Run Command 1765
  Run SCP 1766
stakeholders 2303
state flows
  installed components
    business rules 2431
    script includes 2432
    tables 2430
  rebuilding 2432
State Flows
  using 2432, 2432, 2432, 2434, 2437, 2438
Static Service Portal page 2677, 2678
Strong identification rule 107
style in Content Management
  design theme 446
  design themes 446
  frame 447
frame UI macro 448
Style in Content Management
  style sheets 446
subflow activities
  parallel flow launcher example 3447
  parallel flow launcher for 3442
  parallel flow launcher input variables 3442
  script values in 3446
  WorkflowCoordinator object in 3445
subflows
  inputs for 3243
  invoking in a parent workflow 3244
  preparing for use in a parent workflow 3244
  variables passed from parent workflow 3243
subscription
  sync to user sets 2913
subscription allocation
  color codes 2922
Subscription form 2902
subscription histories 2907
Subscription Management
  allocate users 2914, 2915, 2917
  color codes 2922
  exclude users 2917
  pending users 2916
  unexclude users 2917
  user sets 2911
Subscription Management admin guide 2900
Subscription Management application 2917
Subscription Management setup guide 2899
Subscription Overview page 2919
subscription plugins 2906
subscription reports 2919, 2921
subscription types 2905
subscription user sets 2911
subscriptions
  allocate users to 2909
  monitoring 2917
  not in list 2905
Subscriptions list 2901
sudo commands
  long running 1679
suggested CI relationship
  add 54
survey
  create groups 2490, 2974
  groups 2491, 2491, 2975, 2975
  module 2529, 3013
  send invitations 2526, 3010
  users 2491, 2491, 2975, 2975
  view instances 2488, 2972
Survey
  groups 2490, 2974
  users 2490, 2974
survey administration
  survey definition 2495, 2979
survey category
  create in survey 2475, 2959
survey definitions
  modify 2495, 2979
  schedule periods 2501, 2985
survey designer
  configuring a survey in 2472, 2956
  elements 2468, 2952
  template questions 2502, 2986
survey management
  categories 2474, 2958
  category create 2475, 2959
  category weights
    survey designer 2488, 2972
    key terms 2442, 2926
  questions 2505, 2989
  roles 2441, 2925
scorecards
  average ratings 2455, 2939
  category results 2451, 2935
  history 2457, 2941
  question results 2453, 2937
survey designer
  allow retakes 2492, 2976
  categories 2474, 2958
  category weights 2488, 2972
  edit survey 2487, 2971
  publishing a survey in 2493, 2977
  questions 2475, 2959
  select survey recipients 2491, 2975
  survey results
    view 2448, 2932
    view all 2447, 2932
surveys
  auto-notification 2528, 3012
  customize appearance 2493, 2977
  designing 2467, 2951
  distribute 2526, 3010
  distribute URL 2528, 3012
  export 2529, 2529, 3013, 3014
  import 2529, 3013
  instance URL 2528, 3012
  question data types 2480, 2510, 2964, 2994
Service Portal 2463, 2947
  survey definitions 2495, 2979
  survey designer elements 2468, 2952
  take 2443, 2927
  test survey URL 2528, 3013
  update sets 2298, 2530, 3014
  URLs 2527, 3011
sync subscription 2913
Synchronize services 189

T
  table access
    live feed 530
  table notifications
    live feed examples 526
    setting up for non-task tables 525
tables
  installed with task communications management 3024
  installed with tcm 3024
Tables
  Notify 935
tables installed with live feed 534
Task Activities 3423, 3423, 3423, 3424, 3428, 3464
task communication management
  overview 3021
  topics 3029
task management
  overview 3021
task table notifications
  live feed 523
task type
define 3034
tasks
delegate 2240
tcm
  topics 3029
Tests
  managing 328, 330, 331, 335, 337
Time
  view system logs 641
Timeline Visualization
  create 3039
  create view 3045
  use Timeline Visualization 3045
timeline visualizations
  installed components 3038
Timeline Visualizations
  lanes, markers, and panels 3046
  personalize Timeline Visualizations 3047
  slider and slider track 3051
  view timeline visualizations 3051
  work with timeline visualizations 3052
Tokenization 1100
topic 3105
Transform business service 188
transitions that do not terminate on an activity
  reporting 3302
trigger condition
  create 2521, 3005
  example 2525, 3009
  for assessments 2316
trigger conditions 2521, 3005
troubleshoot map 190
Twilio
  account
    associating 946
    endpoints
      configuring 948
Legacy notify
  configuring 946
U

UI Macro
Service Portal 2633
ui policies
installed with task communications management 3027
installed with tcm 3027
unexclude
users from subscriptions 2917
Unlimited subscriptions 2905
unsubscribe
users from subscriptions 2917
Update services 189
update sets
use with assessments 2298, 2530, 3014
use with surveys 2298, 2530, 3014
upgrade
proxy server 1149
Upgrade test 1621
upload document
attachment 1543
usage
subscriptions 2917
Use Chat
add a favorite room 996
add favorite user 985
change the display 996
chat window 992
create a chat room 987, 989
delete a chat room 998
invite a user 996
join chat room 991, 992, 992
join one-to-one chat 991
message 994
remove a favorite room 997
remove favorite user 985
send emotions 994
send message 993
set chat preferences 997
start a one-to-one chat 987
task 989, 992
task record 992
update profile 980
update status 981
use favorites list 983
view a room 986
view online user 985
use feeds in live feed
activity stream 566
create a group feed 565
create record feeds 566
delete a feed 573
group feed 570
invite a new member 570, 570
leave a feed 573
live feed 566, 573
mark a feed as a favorite 569
navigate 573
other modules 573
participate in a feed 568
record feed 570
record feeds 566
records 566
remove a member from a feed 571
subscribe to a feed 572
view a feed 570
view a feed member 570
use hashtags in live feed
add an image to a hashtag 543
bookmark a hashtag 545
change a hashtag 542
follow a hashtag 544
merge a hashtag 542
posted message 546
remove a hashtag 546
tag messages 540
unfollow a hashtag 544
view available hashtags 541
use knowledge
mobile 1440
use teams in live feed
automatic team creation 550
create a team 547
delete a team 555
e-mail 553
e-mail notification 552
feed notification 553
invite a new member 551
join a team 550
leave a team 553
manage 553
membership request 553
modify a team 553
remove a member 551
reply to notifications 553
subscribe 552, 553
team 553
team notification 552
view a team feed 550
view a team member 550
useful attachment scripts 688
user access
event management 195, 196
service mapping 195, 196
user creation
enabling automatic creation 751
user criteria
Service Portal 2882
user notification preferences
channels 822
conditions 822
global switch 822
notification channels 828
User notification preferences
create channels 826
user notification preferences UI15 836
user notification preferences UI16 822
user roles
installed with live feed 535
user set
roles 2907
user sets 2911
users
allocate to subscriptions 2914, 2915

© 2018 ServiceNow. All rights reserved. 3498
exclude from subscriptions 2917
pending allocation 2916
unexclude from subscriptions 2917
unsubscribe 2917
using approval rules
  generate approvals 2421
using approvers related list
  generate approvals 2422
using social IT
  post content in live feed 585, 587, 589, 591, 592, 594, 595, 595
  post content in Live Feed 585
  record feeds 521, 521, 522, 522, 522, 523
  use feeds in live feed 565, 566, 566, 566, 568, 569, 570, 570, 570, 571, 572, 573, 573, 573
  use feeds in Live Feed 565
  use hashtags in live feed 540, 541, 542, 543, 544, 545, 546
  use hashtags in Live Feed 540
  use teams in live feed 547, 550, 550, 550, 550, 551, 551, 552, 553, 553, 553, 553, 555
  use teams in Live Feed 547
Using Social IT
using workflows
  generate approvals 2422
Using Workflows
  workflow concepts 3318, 3319, 3319, 3320, 3320, 3321, 3323, 3323, 3325, 3327, 3327
utility activities
  branch activity 3432
  join activity 3432
  lock activity 3433
  log message activity 3436
  log trace message 3436
  REST message activity 3436
  Return value activity 3438
  Run script activity 3438
  set values activity 3438
  SOAP message activity 1758, 3439
  turnstile activity 3440
  unlock activity 3442
  workflow 3432
Utility Activities
  join activity 3235

V
variables
  adding 2577
Verifications
  configuring 2158
view
  bubble charts 2328
  channels 3035
  communication channels 3035
  survey results 2448, 2932
View a quiz instance 2561
view legacy chat messages
  journal field 998
View System Logs
  email logs 641
View the overview of all surveys 2467, 2951
viewing
  calls
    conference 943
    conference call 943
  Legacy notify
    conversation 942
    properties 950
  Legacy Notify
    message 942
    question 939
    properties
      Legacy Notify 950
virtual agent
  branding 3082
Virtual Agent
  predefined topics 3059
Virtual Agent designer 3093
Virtual Agent Designer
  user inputs 3111
visual task board
  checklist template 3182
visual task board checklist template 3182
visual task boards
  activate 3159
  attachments 3175
  board structure 3164
  browser support 3163
  card details 3173
  checklists
    configuring 3182
    creating new 3181
    deleting 3182
  client script 3163
  configuring 3194
  connect
    sharing visual task boards in 483, 496, 3193, 3193
    deleting 3169
    favorite 3187
flexible boards
  adding tasks to 3172
  configuring card limit 3198
  creating 3168
freeform boards
  adding personal tasks to 3170
  adding tasks to 3171, 3171
  configuring card limit 3197
  creating 3168
  moving cards between boards 3184
  tasks 3170
guided boards
  adding tasks to 3172
  configuring card limit 3198
  creating 3168
installed components
  business rules 3162
  client scripts 3161
  notifications 3163
  properties 3161
tables 3160
labels
configuring 3196
lanes
adding 3169
deleting 3169
modifying 3169
members
adding 3190
removing 3190
script 3163
scripting support 3163
SLA indicators 3191
task cards
archiving 3183
assigning 3178
labels 3177
moving between boards 3184
moving between lanes 3184
opening form view of 3184
types 3164
using 3168
viewing board information 3186
Visual task boards
installed components
script includes 3161
Visual Task Boards
list view 3190
VMware credentials 1053
VTB

card view configuration 3198

W
weight for metric categories 2275
widget client script 2841
widget client script global functions 2853
widget developer guide 2807
widget empty state 2843
widget html template 2841
widget server script 2841
widget server script variables 2853
Widget tutorial 2839, 2839, 2841, 2843, 2845, 2848
Windows credentials 1054
Windows installer
Password Reset 2126
Wizard Panels
change a banner setting 2596
create a fixed wizard banner step 2596
use wizard banners 2599
wizard variables 2577
wizards
transitions 2575
variables 2578
Wizards
activate a system wizard 2600
advanced customization 2603
advanced wizard 2603, 2604, 2604, 2605, 2605, 2606, 2607, 2607, 2608, 2609, 2609
catalog order and checkout panels 2594
concepts 2602
create a basic wizard 2571
create a panel 2597
create a survey wizard 2588, 2588, 2589, 2590, 2591, 2592, 2592, 2593
create the first panel 2572
create the second panel option 2573
define a basic transition 2601
define a wizard variable 2571, 2600
define a transition 2585
define a question 2586
edit a panel 2599
field setters 2594
KB viewers 2594
panels 2594, 2596, 2596, 2599
public 2581, 2581, 2581, 2582, 2582, 2583, 2583
publish the wizard 2579
record generators 2594
redirect panel 2594
survey wizards
configure the survey property 2584
create 2586
create a dynamic effect 2585
create a page 2584
create a survey condition 2585
create the email notification 2585
define a question 2586
define a transition 2585
Installed components 2586
plugin 2587
test 2598
test the wizard 2575
WMI Windows Installer Provider 1939
Workday
activating 1828
activity pack
Check User Exists 1985
Create User in Users Table 1986
Get Employee Info 1980
GlideActions activities 1985
Update Employee Contact activity 1982
Update Employee Work Email activity 1983
Update User in Users Table 1987
configuration of 1830
credentials for 1829
e-mail triggers
adding notification types 1833
notifications for 1836
Orchestration workflow 1838
Orchestration for 1828
properties for 1831
workflow
activity designer
activity packs 1840
copying activities 2100
Template conditions 2026
canceling 3333
context
administering 3329
menu options 3208
performance timing 3367, 3367
roles 3329
scheduling 3336
title bar controls 3208
Workflow
Documentation tab 3224
Workflow activities

- activity designer 3367
- activity result value 3463
- adding to a workflow 3456
- core 3367
- correcting skipped activities 3465
- creating custom transitions 3461
- duplicating in a workflow 3458
- elements listed 3455
- locked versions 3470
- managing conditions 3461
- managing transitions between 3459
- Orchestration 3367
- pinning introduction 3471
- publishing a custom activity 3470
- utility activities 1758, 3432, 3432, 3433, 3436, 3436, 3436, 3438, 3438, 3439, 3440, 3442
- viewing descriptions of 3454

Workflow activities overview 3368

Workflow Activities

- multiple timer activities in one workflow 3470
- Notify 888, 3405
- SLA Percentage Timer 3416
- Timer 3417
- timer activities 3416

Workflow activity

- Forward to notify client 897, 3410
- queue 898, 3415
- Send SMS 891, 3413

Workflow activity

- Call 890, 3411
- Forward call 892, 3406
- Hang up 894, 3408
- Join conference call 888, 3412
- Reject call 896, 3409
- Say 896, 3410

Workflow Activity

Input 893, 3406

Play 895, 3408
Record 895, 3409

Workflow Administration

- error 3354
- errors 3348, 3353
- workflow timelines 3342, 3342, 3346, 3347

Workflow Concepts

- data separation 3323
- delegated administration 3321
- domain separation 3320
- restrictions 3320
- workflow caching 3327
- workflow engine operation order 3325
- workflow permissions 3323
- workflow scope 3319
- workflow tables 3327
- workflow versions 3319
- workflows 3320, 3321, 3323

Workflow Editor 3202

Workflow Error Handling

- approval condition 3354

Workflow Events 3256, 3257, 3264, 3266, 3271

Workflow Field 3284, 3285, 3287, 3287, 3289, 3294

Workflow icons 3287

workflow movement with update sets

- avoiding duplicate workflows 3341
- commit a workflow in an update set 3341
- input variable movement 3339, 3339, 3340
- input variable removal 3340, 3340, 3341, 3341
- update set migration 3341, 3342
- workflow update set migration 3337, 3337, 3338, 3338

Workflow run

- determine 3238
- workflow run time metrics 3367

Workflow stage icons 3287

workflow stage sets

- add a stage set 3283
- create a stage set 3281
- export a stage set 3283
- import a choice list 3283
- use default 3279, 3282

Workflow Stages 3273, 3277, 3279, 3280, 3280, 3280

Workflow validation 3236, 3294

Workflow Validator

- validate subflows 3303
- ValidateDanglingTransition 3302
- ValidateInputVarUpdateSetDependencies 3314
- ValidateLowestCommonTable 3305
- ValidateParentFlow 3307
- ValidateScriptForCurrentDotUpdate 3304
- ValidateSingleEnd 3307
- ValidateTableChange 3306
- validateTransitionIn 3301
- ValidateTransitionOut 3299
- ValidateUpdateSetDependencies 3310
- ValidateUpdateSetParentDependencies 3312
- ValidateWorkflowEndStages 3315
- ValidateWorkflowStageColumn 3316
- ValidateWorkflowStateValues 3316

workflows

- add activities 3236
- cancel with a script 3335
cancelContext(context) methods 3335
check out 3238
create 3222, 3229, 3231, 3233
edit 3238
ending with multiple branches 3235
error tracking for 3349
invoking subflows in 3244
palette 3206
passing variables to a subflow 3243
prepare for adding subflow 3248
preparing a subflow for 3244
publish 3237
selecting activities for 3206
subflow inputs 3243
subflows in 3240, 3450

X

XML API 1179
XmlContent 1179
XMLContent
    getIterator() 1181
    getIterator(String xPath) 1182
XMLContent API 1181
XMLElement
    encodedQueryFor(String tableName) 1184
    getAttributeValue(String attribute) 1185
    getIterator(String xPath) 1183
    getIteratorOverAllChildren() 1183
    getName() 1184
    valueFor(String tableName, String fieldName) 1184
XMLElement API 1183
XMLElementIterator
    hasNext() 1182
    next() 1182
XMLElementIterator API 1182